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Chemists and Labor Unions

WE ARE informed that chemists and assistants on the staff of the Health Department of New York City have joined the Union of Technical Men, affiliated with the American Federation of Labor. With all appreciation of the American Federation of Labor and with due respect for the chemists and assistants on the staff of the New York Health Department, we think the latter should be ashamed of themselves. They occupy posts of grave responsibility, and they have turned over the ordering of their work to an irresponsible authority. If a strike should be called among them the health of over five million people would be put in jeopardy while the single problem of their pay or their hours or their recognition as a body was in process of settlement. Whether such an outrageous act is recorded as a crime on our statute books or not, the fact remains that such a strike would be criminal in the highest degree.

We hold no brief against labor unions or against collective bargaining for labor, either skilled or unskilled. But a professional man, in taking up his profession, assumes responsibilities beyond his daily wage. His education has cost either this or some other community more than he paid for it, and that is the least of his obligations to make good. In entering the service of the city he can stay as long as he likes and leave it whenever he can better himself. But for him to join a labor union and to use a labor union's medium of the strike, whereby a great community is threatened with infection and disease for the sole purpose of improving the conditions of his precious self, is getting things entirely out of focus. He isn't worth it and he should know it. And if he had the slightest sense of professional obligation he would know it.

The President's Industrial Conference

NO APOLOGY is necessary for devoting space in technical and engineering journals to the proceedings of the President's Industrial Conference at Washington. Not only are engineers and technical men everywhere in duty bound to inform themselves on industrial problems, but there is sufficient evidence that the daily press does not always reflect the proceedings of such a conference as an engineer would see them. If reasons are needed, these are ample. Furthermore, the technical press has its share of the responsibility in keeping the thought of the country straight and sane on what is undoubtedly the most momentous problem before us today—satisfactory industrial relations.

The President's Industrial Conference is designed to be representative of the three parties in interest in industrial disputes, viz., Labor, Capital and the Public; or as they may be otherwise designated, Employees, Employers and the Public. It must be evident how difficult a task confronted the President in appointing such a conference, and probably his failure to select a thoroughly representative group was no greater than would have been experienced by anyone else essaying the task. But the fact remains that in the Conference Labor represents organized bodies only, and can by no stretch of the imagination be expected to express the concrete thought of the employees of the country. Labor is the only unified group in the Conference, but it is so because it comprises only members of unions. The Employers are more diverse in their interests, but here too there is lack of representation from many branches of industry. Finally, the Public is represented by a mixed group of Presidential appointees who come from many walks of life and are probably more representative of the people's thought than either of the other groups. Comment is openly made, however, that the Public Group has distinct sympathies toward Labor in its demand for more recognition of the worker and more equitable distribution of industrial production.

The first week of the Conference can scarcely inspire confidence in the hope that it will accomplish something constructive for the industrial life of the nation. Two things are evident: In the opinion of many, as expressed openly in the conference by Dr. ELIOT of the Public Group, Labor has not brought forward any distinctly new or progressive measures for consideration. Labor's proposals are those with which we have been familiar for many years, couched in the same old language and not fundamental in their scope. They are the same "demands" that have formed the basis of combat in years past, and can be designed only to strengthen the means of combat in the future. Second, the introduction of a resolution to have the Conference investigate and

settle the steel strike is generally regarded as ill advised and likely to prove a bone of contention that will threaten the usefulness of the Conference in devising a constructive program of industrial relations.

In our judgment the steel strike resolution should not have been introduced, because it is not germane to the purposes of the Conference and can only cause endless wrangling. Under the rules of the Conference there is not the slightest chance of a favorable vote on it, and an adverse vote may prove disastrous to further constructive work. Just what purpose Labor may have in bringing the matter forward at this time is not for us to say; but it is not difficult to surmise that the leaders seek thereby to divert public sympathy to the strike instead of from it, which latter is now the acknowledged trend. By offering to have the Conference adjudicate the strike, Labor can assume a maganimous attitude before the country and can likewise play the role of martyr if the resolution is voted down, which it certainly will be if a vote is reached. On the other hand, should the Conference adopt the resolution, and should the strike be adjudicated in favor of the strikers, organized labor can find little for self-congratulation, because the strike is known to be the work of radicals within the labor movement, who would construe success as approval of their leadership. Nothing could be worse for Labor as a whole.

Control of Large Corporations And of Large Labor Unions

CONGRESS should give careful thought to the suggestion of Judge GARY, chairman of the Steel Corporation, before the Senate Committee on Education and Labor, investigating the iron and steel strike. Judge GARY expressed the opinion that concentrated capital should be under supervision and control of a Federal commission and that concentrated labor should be subjected to control of the Government and of the law.

This statement is carefully put. Is it saying something to assert that concentrated labor should be subject to the law? It is. Twenty-seven years ago Judge PAXSON, Chief Justice of the Supreme Court of Pennsylvania, selected, on account of the importance of the case, to charge the Grand Jury at Pittsburgh in the case against the Homestead strikers of 1892, said:

"It was not a cry for bread to feed their famished lips; the result of sudden outrage, with good provocation; it was a deliberate attempt of men without authority to control others in the enjoyment of their rights. The existence of such a state of things, in a government of law, indicates a weak spot somewhere. It is not in law itself. That is sufficient for the preservation of order; all that is needed is its proper enforcement."

Since Justice PAXSON delivered those words there has been no improvement, as shown by the wholesale lawlessness in the iron and steel strike that began September 22. The lives of wives, mothers and children have been threatened, and there have been threats that homes would be burned in hundreds, possibly thousands, of cases, just for the purpose of keeping men from working. Mobs have marched from a striking plant to another that was operating and have gotten the men out, simply at the time the shifts changed. It seems to be a fair estimate that of the men employed in the iron and steel industry 10 per cent wanted in advance to strike; 20 per cent were inclined to strike when the time came, and 20 per cent were put out of employment by intimidation, making 40 per cent idle altogether. Some plants and some districts were closed entirely, others operated in full or in large part. The difference was made by two things, the difference in distribution of the men who wanted to strike, and the difference in the amount of protection afforded by the civil authorities.

Public sentiment has been largely responsible for this state of affairs. Justice PAXSON referred to that also, in his charge of 27 years ago. There is more sympathy for the man who wants to strike than for the man who wants to work. The morals of the public are very lax, and sympathy for the striker develops into a disposition to condone lawless acts.

There is a reason, however poor, for everything, and there is a reason for this state of the public mind. It is the notion that somehow or other the wage earner is at a disadvantage and is entitled to some extra consideration. Granting that such may be the case sometimes, it is equally possible for the wage earner to have an undue advantage. The pendulum may swing so far that injury will be caused everyone, for if men get too high wages and work too little they will eventually suffer and the public will certainly suffer through having to pay too much for goods, while capital may be destroyed. The public was given some very good food for thought in the Boston policemen's strike.

Why should it be difficult for us all to adopt the conception that the man and the job are equally important, that each has in essence what amounts to an undivided half interest in prosperity, that either is useless without the other?

There was fear at one time that large aggregations of capital were inimical to the public interest. Experience has shown that large corporations are amenable to public opinion, and indisposed to misuse the power they possess. Experience, and particularly recent experience, shows that large aggregations of workmen are disposed to misuse their power, to the extent of trampling on the law wherever they think it to their advantage. Whether the one requires control more than the other need not be debated. Let Congress simply decide that both must be controlled, and let it be made known universally, by whatever medium or means necessary, that the laws must be obeyed and that in a labor contest men have no license to disregard the law.

Readers' Views and Comments

H. R. Bills 5011, 5012 and 7010, 66th Congress, First Session

To the Editor of Chemical & Metallurgical Engineering

SIR: The above bills in relation to patents were drawn by a carefully selected committee of the Research Council. They provide for a separate Patent Court of Appeals, to be established in Washington, consisting of a Chief Justice, appointed by the President for life, and six Assistant Justices, to be appointed for respective terms of six years, by the Chief Justice of the U. S. Court of Appeals, from among the U. S. Circuit Judges. By this means it is hoped to shorten patent litigation; an inventor or owner of a patent without unlimited capital may nevertheless secure his rights. Our present method of providing for this in nine U. S. circuit courts of appeal, of concurrent jurisdiction but limited territorial authority, makes this exceedingly difficult.

Another provision raises the salaries of the staff to a range commensurate with that provided for the staffs of other departments. This principal examiners are to receive $4000 instead of $2000, as at present; and various grades of assistant examiners are to be increased in proportion. The integrity and technical competence of these men, numbering several hundred, constitute the key to our patent organization. Every neglect, every error, in regard to important inventions, is fraught with heavy costs for litigation, which, in the end, the public must pay. Such defects also make for disorder and confusion. The entire increase, as I recall it, involves between $900,000 and $1,000,000 per year. I believe a considerable part of this would be defrayed by the fees taken in response to a better patent situation. Under present conditions, at the existing rates of pay, the Commissioner cannot maintain an adequate standard of technical capacity in his staff.

Another provision authorizes the court to determine upon a reasonable royalty in the case of infringement. It is very rare that the owner of a patent can give the exact measure of the damages incurred through infringement by his opponent, inasmuch as a single patent seldom covers the whole of an article which is made and sold under infringement. The usual award in such cases is six cents to a successful contestant for his patent rights where these are proved.

Still another provision removes the Bureau from the jurisdiction of the Secretary of the Interior, and makes it a separate bureau. Under existing conditions the Honorable Secretary of the Interior has in substance no authority over the Bureau to make changes in organization or procedure, although his approval is required for these.

I respectfully urge on your favorable consideration the bills above mentioned. E. P. O.

New York City.

The Design of Electric Furnaces

To the Editor of Chemical & Metallurgical Engineering

SIR: In your issue of Sept. 1 you have an article by R. C. Gosrow entitled "The Design of Electric Furnaces." Mr. Gosrow in his article refers to an article of mine originally appearing in the Transactions of the A.I.M.E. which you abstracted. In looking over Mr. Gosrow's article I find on page 238 tabulated details with reference to a certain furnace. It is there stated that with a 1650 kw. input his furnace produced 16 tons of 81.5 per cent ferromanganese daily from ores of which he gives an analysis.

I wish to call your attention to the fact that this is an impossibility. Were it true it would mean that the furnace produced ferromanganese for something like 2360 kw-hr. per ton. The lowest figure that I have ever seen is 4000 kw.-hr. per ton of metal, and this is open to some question. I have been interested in figuring the theoretical power consumption in the case of this furnace and find that it would require about 6500 kw-hr. per ton. Is the 16 tons a misprint?

E. S. BARDWELL.

Great Falls, Mont.

To the Editor of Chemical & Metallurgical Engineering

SIR: Mr. E. S. Bardwell's comment on my article in the Sept. 1 issue of CHEMICAL & METALLURGICAL ENGINEERING is not without justification. My original figures were compiled from furnace reports and data. The tonnages of alloy and the consumption of energy show an average kilowatt-hour consumption per ton of alloy of 2860. The figures as given in my report and article are correct for furnace load, and the error undoubtedly occurred through transposing the reports into the figures for this article. This then shows an average tonnage for the period of 13½ net tons, which is what the average from the actual tonnages shows.

I do not doubt Mr. Bardwell's statement that 4000 kw-hr. is open to question when other reducing agents are used than charcoal or coke, and running an excessively hot top furnace.

I cannot check Mr. Bardwell's figures for theoretical power consumption at about 6500 kw-hr. for this furnace. R. C. GOSROW.

Seattle, Wash.

The American Academy of Arts and Sciences has voted an appropriation of $300 to Professor Frances G. Wick of Vassar College to aid her in research on the phosphorescence of hexagonite and of fluorite at ordinary and low temperatures, and to Dr. R. W. Wood, professor of experimental physics at Johns Hopkins, $350 in addition to former appropriations for continuation of optical investigations.

Six thousand dollars has been given to Columbia University for special research in food chemistry.

Western Chemical and Metallurgical Field

Northwest Magnesite Co.

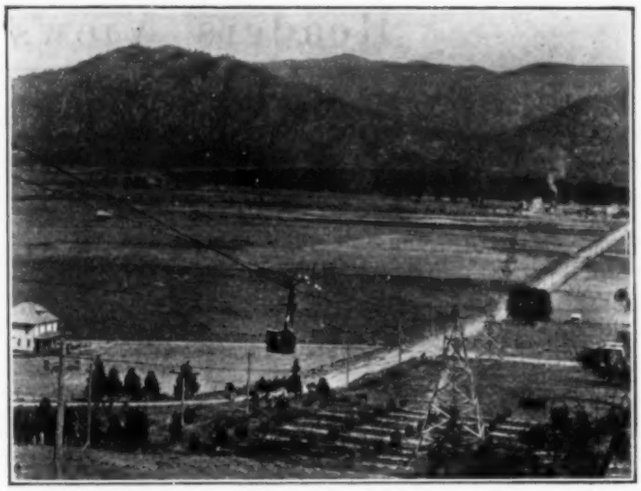
The company quarries from a large deposit of crystalline magnesite near the town of Chewelah, in Stevens County, Washington, about 60 miles north of Spokane. The mineral occurs as a replacement of lenses of dolomite in sedimentary rocks, in which are found dolomite, shale and quartzite, and into which basic igneous rocks have been intruded. A large portion of the deposit has been diamond-drilled to a depth of 300 ft. By this means data have been obtained for classifying the deposit in sections, depending upon lime and silica content. About a million tons of high-grade mineral has been explored by drilling. Owing to the thickness of the high-grade deposits, it is unnecessary to employ manual methods for selecting ore during or after mining.

At the present time, the bulk of the mineral is being taken from an open quarry near the top of a ridge known as Finch Quarry, whence it is lowered by an

FINCH QUARRY

aërial tramway to a crushing plant near the foot of the ridge. The crushing plant consists of a large jaw crusher which takes the mineral as quarried and delivers it to one of a set of two gyratory crushers, which reduce it to 2-in. size and deliver it to the storage bins at the tramway head. From these bins the mineral is transported by an aërial tramway five miles in length and delivered into the crushed mineral storage bins at the calcining plant. The storage bins have a capacity of 800 tons, which is sufficient to supply the plant 24 hours. The entire operation of quarrying, crushing and transporting being mechanical, the crushed mineral is delivered to the storage bins at the calcining plant at a minimum cost.

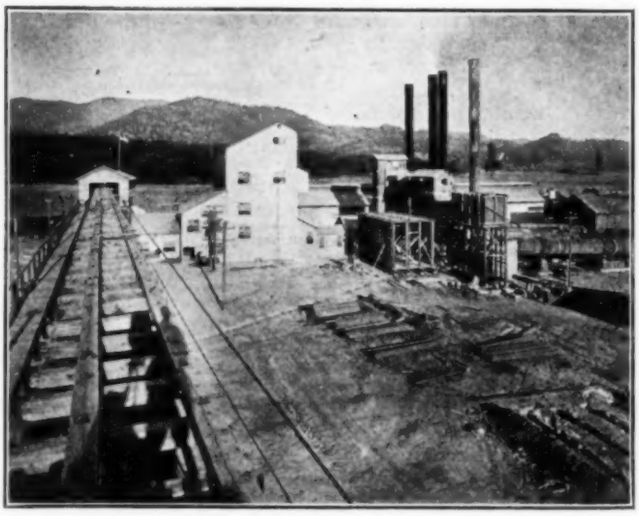
The first operation at the calcining plant is a further reduction of the mineral by means of a set of rolls; this final product will all pass through a 10-mesh and about 20 per cent will pass through a 100-mesh screen. The proportion of the fine material in the crushed mineral is important, as it assists materially in producing a uniform product as a result of the reaction between the iron oxide and the magnesite in the rotary kiln. The crushed mineral is weighed in 1-ton batches and to each



AERIAL TRAMWAY

batch is added about 40 lb. of finely pulverized high-grade magnetite (iron oxide). The weighed materials are delivered to, and thoroughly incorporated by, a rotary mixer, from which the product is delivered by means of an elevator and conveyor to storage bins at the head of the rotary kilns.

The rotary kilns, of which five are installed, are 125 ft. in length, 7 ft. 6 in. in diameter; they are lined throughout with 9-in. No. 1 fire clay brick. Powdered coal of a sub-bituminous type obtained from a nearby mine is used for fuel, being supplied to the kiln by a Bonnet pulverized-coal-system of 150 tons daily capacity. About 700 lb. of coal containing 12,000 B.t.u. per lb. is required to produce one ton of ferromagnesite. Each kiln has a maximum capacity of 70 tons of dead-burned magnesite per day. About 2.2 tons of raw material is



CALCINING PLANT

required per ton of finished product. The incandescent ferromagnesite emerging from the kilns is cooled by passing through revolving air-cooled steel tubes; it is then crushed by rolls and sorted by screens into sizes required by the trade. The ferromagnesite building has storage capacity for 1000 tons of finished product and is located on a spur track, loading being direct into cars. The process of manufacture from the crushed ore storage bins to the finished product storage is continuous.

President's Industrial Conference Meets in Washington

Three Groups, Representing Labor, the Public and Employers, Convene to Reach, if Possible, Some Common Ground of Agreement and Action With Regard to the Future Conduct of Industry—Resolutions Presented by the Groups

THE Industrial Conference called some weeks ago by the President "for the purpose of reaching, if possible, some common ground of agreement and action with regard to the future conduct of industry" convened in Washington at the Pan American Union Building, Monday afternoon, Oct. 6. Owing to the illness of the President the Conference was called to order by Secretary of Labor Wilson, who acknowledged the courtesy of the Pan American Union in granting the use of the building for this occasion, and called upon John Barrett, Director General of the Pan American Union, for a brief address. Mr. Barrett's remarks were particularly appropriate, and calculated to throw an atmosphere of peace and harmony about the proceedings. Speaking of the Union as a practical league of 21 American nations, Mr. Barrett said that the deliberations of its board of governors had been the means of averting at least six potential wars among the member nations, while no conflict of any importance had occurred since the Union was established. Dedicated to the purposes of peace, the Union hoped that the Industrial Conference might be successful in finding a just and fair solution to its problems amid surroundings where many political issues had been amicably settled.

Labor, the Public and Employers Represented

The official delegates to the Conference comprised three groups, representing Labor, the Public and Employers. Labor delegates were seated on the left, Employers on the right, with representatives of the Public in the middle. Over 75 representatives of the daily and industrial press were present to report the proceedings.

After the President's official call was read there was a roll call of delegates representing respectively:

The Public: Bernard M. Baruch, Robert S. Brookings, John D. Rockefeller, Jr., Elbert H. Gary, Charles W. Eliot, John Spargo, O. E. Bradfute, Ward M. Burgess, Fuller E. Calloway, Thomas L. Chadbourne, H. B. Endicott, Paul L. Feiss, Henry S. Dennison, George R. James, Thomas D. Jones, A. A. Landon, E. T. Meredith, Gavin McNab, L. D. Sweet, Louis Titus, Charles Edward Russell, Bert M. Jewell.

Women: Lillian D. Wald, Gertrude Barnum, Ida M. Tarbell.

Chamber of Commerce of the U. S.: Harry A. Wheeler, Ernest T. Trigg, Herbert F. Perkins, John J. Raskob, Homer L. Ferguson.

Farmers' Organizations: J. N. Tittemore, T. C. Atkeson, C. S. Barrett.

Investment Bankers Association of America: Edgar L. Marston, Howard W. Fenton.

Organized Labor: Samuel Gompers, Frank Morrison, Daniel J. Tobin, Joseph F. Valentine, Frank Duffy, W. D. Mahon, T. A. Rickert, Jacob Fischer, Matthew Woll, John L. Lewis, Mrs. Sarah Conboy, William H. Johnston, Paul Scharrenberg, John H. Donlin, M. F. Tighe.

National Industrial Conference Board: Frederick P. Fish, J. W. O'Leary, S. Pemberton Hutchinson, Edwin Farnham Green, Leonor Fresnel Loree.

Railroad Brotherhoods: Engineers, H. E. Wills; Fireman, P. J. McNamara; Trainmen, W. G. Lee; Conductors, L. O. Sheppard.

Railroad Managers: R. H. Aishton, Carl R. Gray.

Purposes of Conference Explained by Secretary Wilson

Secretary Wilson then delivered a short address on the purposes of the Conference. First expressing regret that the President was unable to direct the Conference in person, the Secretary reviewed briefly the industrial conditions that had grown out of the war. The loss of life, the destruction of material resources, the derangement of industry, and the instability of governments have all contributed to the most difficult peace-time problem that has ever confronted the country.

"The effect of these things," he said, "has been reflected in the high cost of living and the consequent demand for higher wage rates to meet the increasing burden of the family budget. Yet increases in the wage rate do not always give relief. There are but two ways by which the general standard of living of the wage-workers can be improved. One is by increased productivity, making more material available for wages. The other is by taking the means of increased compensation out of the profits of the employer. If wages are increased and profits remain the same, the burden is passed on to the consuming public in the form of an increased cost of living, and comes back in that form to the wage-worker himself. No portion of improved standards of living can come out of the profits of the employers unless there is profiteering.

Whole World Interested in Production

"The whole world is interested in returning to the highest productive efficiency, having due regard to the health, safety, and opportunities for rest, recreation and improvement of those who toil. The most productive we are the sooner we will replace the wastage of war, return to normal price-levels, and abolish the opportunity for profiteering. There can be no profiteering where the production is ample to meet the needs of the people of the world if there is a free flow of

material from producer to consumer. It is only where the production is not sufficient for the needs of the people, or, when sufficient, where artificial obstructions impede proper distribution that there is any possibility of profiteering. Anything that restricts the highest efficiency commensurate with the physical, mental and spiritual well-being of the workers tends to retard the progress of the country as a whole.

Industrial Justice the Basis of Industrial Peace

"For that reason we are all interested in the maintenance of industrial peace, but there can be no permanent industrial peace that is not based upon industrial justice. Nor is it sufficient that either side to an industrial controversy should be the sole judge of what constitutes justice. The means must exist by which all men may know that justice has been secured. An imaginary wrong has all the force and effect of reality until it is shown that it is only imaginary. We have found ways of regulating all the other relations of mankind. Surely human intelligence can devise some acceptable method of adjusting the relationship between employer and employee.

"The right of any man to cease working for another for any reason that is sufficient to himself is the basic element of human liberty. The right of any person to refuse to operate his plant at any time he desires to do so is the exercise of a property right guaranteed by the Constitution. It does not follow that because these rights exist it is necessary to exercise them. They must nevertheless be safeguarded. Having done that and having devised the machinery by which justice can be secured and by which everybody at interest has the opportunity of knowing that justice has been secured, it is not likely that the right to cease work will be exercised by sufficient numbers, or the right to cease operating industrial plants will be carried to such an extent as to seriously affect the welfare of the balance of the people."

Committees Appointed

Following the Secretary's address, which was well received, he announced that the Conference would perfect its own organization and method of procedure. At his suggestion each of the three groups of delegates appointed two committees of three each, to constitute general committees (1) on organization and nominations and (2) on rules and order of business. The appointees were as follows:

On organization and nominations: Labor—Messrs. Morrison, Tobin and Sheppard. Employers—Messrs. Perkins, O'Leary and Marston. The Public—Messrs. Landon, Meredith and Brookings.

On rules and order of business: Labor—Messrs. Mahon, Woll and Lee. Employers—Messrs. Green, Wheeler and Atkeson. The Public—Messrs. Baruch, Chadbourne and Rockefeller.

The Conference then adjourned until Tuesday morning, Oct. 7, and the committees met immediately thereafter for the transaction of business

When the Conference again convened a permanent organization was effected with the Hon. Franklin K. Lane, Secretary of the Interior, as chairman, and J. J. Cotter and Lathrop Brown as secretaries. The selection of Mr. Lane as chairman was regarded by all as particularly happy on account of his recognized interest in the purposes of the Conference, his record for fairness and his private and public integrity. In his speech of acceptance Mr. Lane expressed confidence in the possibility of finding a solution for the problems to be considered. He approved of the Conference, which he said is the most important extra-legal body organized within our time. He also scouted the idea that social revolution would be necessary to accomplish the reforms in this country which have been sought by violent means in Russia and elsewhere, because, he said, our democracy had been achieved by a revolution that established our principle of government once for all. He considered the qualities of ignorance and arrogance to be the causes of unrest and dissatisfaction, and said that by the exercise of intelligence and tolerance we could be assured of some degree of success.

The committee on rules and order of business made its report, submitting a scheme of which the following were the salient points: Organization by groups for the consideration within the groups of any matters which members of the Conference may wish to bring before the entire body; assent required by each group before any proposal could be submitted to the Conference; a general committee of 15, five from each of the three groups, to which shall be submitted all proposals emanating from the groups; report by the general committee to the Conference, with or without recommendations; provision for minority reports; limitation of debate to 10 minutes; public sessions.

The General Committee was then constituted by group action, as follows:

Employers—Messrs. Hutchinson, O'Leary, Perkins, Raskob (secretary), Tittemore.

Employees—Messrs. Gompers, Morrison (secretary), Woll, Sheppard, Mahon.

The Public—Messrs. Chadbourne (chairman), Endicott, Landon, Russell, Miss Wald.

Rules of Procedure

When the Conference convened Wednesday morning, it was merely to announce the organization of the General Committee and a few additional rules of procedure. According to the rules adopted by the Conference, all proposals and programs must originate in one of the three groups, be referred automatically to the General Committee of 15 if assented to by the group, and then referred back to the Conference, with or without amendment, for debate. Under these conditions the Conference found itself on the third day of its convention without anything to do, but with approved machinery for doing anything that might be brought up. There was nothing to be done, therefore, but to adjourn the Conference until Thursday morn-

ing so that the groups might discuss proposals of their respective members and agree, if possible, on resolutions or programs for presentation to the General Committee.

When Secretary Lane adjourned the meeting for the day he wisely suggested that the delegates remain in the room for half an hour or more and get acquainted with each other. He thought the purposes of the Conference would be advanced if the representatives of the three groups knew one another personally.

Resolutions and Proposals Presented

Following the rules, certain resolutions and proposals were offered by the three groups, representing Labor, the Public and the Employers; and while it is certain that other resolutions will be presented next week, and for that matter throughout the early weeks of the Conference, it may be worth while to examine those already offered and study their points of agreement and divergence.

The Public Group was the first to offer resolutions, and these were presented in the names of their respective authors with the "assent" of the group to their consideration by the Conference. This was strictly in accord with the agreed procedure, and it was made clear that the group did not necessarily approve of the proposals, but merely assented to their presentation as germane to the objects of the Conference.

Labor, on the other hand, when its turn came to offer proposals, brought forward a program in which the group concurred as a whole, thus presenting a united front. Mr. Gompers made it plain that the Labor group had acted as a body in formulating its program, and that there was "no pride of authorship" in any of the proposals. On the contrary, Labor had endeavored to enunciate a series of "principles and actions which they believed would contribute most to the purpose of the Conference as indicated in the President's letter." In this the four railroad Brotherhoods concurred, although doubt had been expressed as to whether they would ever enter the Conference.

When the Employers Group was called upon for its resolutions nothing was offered because of lack of time in which to formulate a prgram to which all would assent. Unlike the Labor Group, which represented a single element, strongly organized and united, the Employers were composed of delegates from widely separated industries, and more time was required to enunciate a set of principles. Later, however, the Employers brought forward one resolution by Mr. Loree and a "statement of principles which should govern the employment relation in industry." Both of these documents were of the highest importance, and the latter was especially broad, comprehensive and progressive.

During the discussion which ensued on the request of the Employers Group for more time, Dr. Eliot took occasion to comment on the purposes of the Conference and on the nature of the resolutions offered by Labor. Arguing that the Conference was called for the purpose of discovering *new* relations between capital and labor, he contended that the program offered by Labor was along old lines and contained only the old familiar contentions that had been the subject of endless dispute. "The fact is," he said, "that the speech just made by Mr. Gompers shows that Labor is here to contend within the Conference for what are called the rights of labor; and there have occurred many indications already that there is a large group of employers who are prepared to resist the methods of approach to business which we have heard proposed by the group of Labor. Among all the propositions that have been submitted to this Conference this morning there are several which relate, not to new relations between capital and labor, but to the old, to the former conditions of things in this country, in regard to industrial strikes, to the strengthening of the modes of combat with which our whole community has now become familiar. I venture to suggest that the Conference ought to make a new start if it is going to bring to pass any substantial results in creating new relations between capital and labor."

Disposal of Resolutions Originating Outside of the Conference

After the three groups had introduced their resolutions, Chairman Lane announced that numerous suggestions bearing on the work of the Conference had been received by him, and he asked what disposal should be made of them. This precipitated a debate in which the attitude of Mr. Gompers was misunderstood as being opposed to receiving outside suggestions. In his remarks on the subject he departed from the question long enough to pay his respects to the manner in which the Conference proceedings were being reported in the daily press, scoring particularly the inaccurate and unfair stories appearing in the Washington *Post*.

On the suggestion of Secretary of Labor Wilson, the Conference finally agreed to receive all suggestions offered from whatever source, prepare them in triplicate and submit them to the three groups of the Conference for consideration.

Labor Asks Settlement of Steel Strike

The first resolution introduced by the Labor Group was one calling upon the Conference to appoint two of its members from each group to constitute a committee to adjudicate and settle the differences between the workers and employers in the steel industry. There was a wide difference of opinion on the propriety of bringing this matter before the Conference, many feeling that the Conference was not called to settle individual disputes but to devise means for effecting settlements and if possible avoiding strikes and lockouts. There was ample evidence that the resolution might become the most contentious matter before the Conference and considerable doubt was expressed as to its adoption.

In addition to this resolution Labor presented a

platform of principles declaring for collective bargaining; the eight-hour day; minimum living wage; equal pay for women performing equal work with men; prohibition of child labor; the establishment of industrial labor boards for conciliation and arbitration; and prohibition of immigration for a period of two years following the declaration of peace.

Similarly the Employers Group offered a set of principles on the following topics: Production; the establishment rather than the industry as a productive unit; conditions of work; wages; hours of work; settlement of disputes; right to associate; responsibility of associations; freedom of contract; the open shop; the right to strike or lock out; training.

Conference to Act in Interest of General Public

The first of the general resolutions to be introduced was that of Mr. F. P. Fish of the Employers Group, designed to commit the Conference to the principle of acting for the whole people—the consuming public—rather than in the interest of any one of the three groups represented in the Conference. The resolution declared that "the questions to be considered by this Conference are of vital importance to all the people of the United States individually and connectively"; that each and every citizen is interested in securing the benefits that would flow from harmonious relations between capital and labor; and that it is the duty of each delegate to feel that he is a representative of all the the people.

Resolutions on Collective Bargaining

The other resolutions introduced during the first week of the Conference covered a wide range of subjects, but can be classified under a few headings. Collective bargaining came in for more attention than any other subject, being the basis of five resolutions. Mr. Dennison of the Public Group offered one suggesting that "employers and employees in every factory should unite in bringing about the development of committees freely elected by the employees (whether as a part of the trade union system or otherwise but not in antagonism to trade unionism) for the joint consideration of such constructive matters as methods of enlisting workers' interest and of improving efficiency of production, which are of mutual value to employers and employees." Another resolution of Mr. Dennison seeks to provide for equality of bargaining power by having (1) employers recognize the right of their employees independently to organize for the purpose of collective bargaining and to be ready to meet "any group of their employees either directly or through representatives"; and (2) labor recognize the right of employers to deal with their employees directly, "through freely elected shop committees or otherwise, as well as through trade unions."

The views of the Labor Group on this important subject were embodied in a part of their propositions. They declared in favor of "the right of wage-earners to organize in trade and labor unions for the protection and promotion of their rights, interests and welfare; the right of wage-earners to bargain collectively through trade and labor unions with employers regarding wages, hours of labor, and relations and conditions of employment; the right of wage-earners to be represented by representatives of their own choosing in negotiation and adjustments with employers with respect to wages, etc." Labor further declared for the "right of employers to organize into associations or groups to bargain collectively through their chosen representatives with respect to wages, etc."

Mr. Rockefeller's resolution on collective bargaining affirmed that inasmuch as the only common ground for agreement in industrial relations must be "the spirit of justice, brotherhood and willingness to put one's self in the other man's place," employees must have representation in industry which will give them an effective voice in determining their terms of employment and their working and living conditions. He believes that the particular form of representation is a question to be decided in each case, but that "adequate representation" shall include provision whereby stockholders and employees' representatives may give current consideration to matters of common interest. He also states that provision should be made "to insure the prompt uncovering of grievances, real or alleged, and their speedy adjustment."

On this same subject the Employers Group made the following declarations: "Each establishment should develop contact and full opportunity for interchange of view between management and men, through individual or collective dealing or a combination of both, or by some other effective method"; and further that "each establishment should provide adequate means for the discussion of all questions and the just and prompt settlement of all disputes that arise between management and men."

Mediation, Conciliation and Arbitration

Related to the resolutions on collective bargaining, and of no less importance, were those on methods of conciliating the parties to industrial disputes and arbitrating their differences. These proposals embodied specific plans, and it is not unlikely that they will comprise the most important subject to be considered by the Conference.

Mr. McNab of the Public Group offered a resolution based on the premise that it is "the purpose of this conference to discover a method of removing the causes of industrial unrest and strife." He proposed legislation by Congress to create a National Board of Conciliation and Arbitration constituted as follows: Four members, at least one of whom shall be a woman, to be appointed by the President; two members to be appointed by the Senate and two by the House of Representatives; and the remainder to consist of the ex-Presidents of the United States and the Secretary of Labor. This board would be available for the settlement of all disputes between capital and labor, acting either as a board or through one of its members being a third party to a joint board of contending

parties. A condition of arbitration by such board would be the resumption of normal relations during the hearing, and the findings would be retroactive to the date of the controversy.

Secretary Wilson's plan calls for the creation of boards of employers and employees in each principal industry and a similar board for miscellaneous industries. Representatives on these boards are to be selected as the employers and employees may respectively determine. Industrial disputes that cannot be adjusted locally are to be referred to the board created for that industry, the board to take jurisdiction whenever in the judgment of one-half of its members a strike or lockout is imminent. If the particular industrial board cannot adjudicate the matter it is to be referred to a general board to be appointed by the President as follows: One-third to be appointed in agreement with organizations representative of employers, one-third in agreement with organizations representative of labor, and one-third by the President direct. This general board must be unanimous in its decision on disputes submitted to it, and in event of failure to reach unanimity the question shall be submitted to an umpire selected by unanimous action of the general board or drawn by lot from a list of 20 persons named by the President to act as such umpires. Decisions, however reached, are to have the force and effect of trade agreements which both sides shall be morally bound to accept and abide by.

The Labor Group's proposal on this subject called for the establishment in each industry of a national conference board, "by agreement between the organized workers and associated employers, consisting of an equal number of representatives of workers and employers." This industrial board should consider subjects affecting the progress and welfare of the industry, promote efficiency of production and the rights of all concerned. Further, the Federal Government should be asked to act through the Department of Labor in encouraging the formation of industrial conference boards in the industries where they do not now exist.

Resolutions on Immigration and Miscellaneous Subjects

Other important proposals touched on such subjects as the high cost of living, hours of labor, wages, the employment of women and children, and immigration. Labor stood fast for the standard eight-hour day, while the Employers declared that hours "should be fixed at the point consistent with the health of the worker and his right to an adequate period of leisure for rest, recreation, home-life and self-development. The standard of the work schedule should be the week, varying as the peculiar requirements of the individual industries may demand." Both sides agreed on the necessity of one day of rest in seven; the payment of overtime at the rate of time and a half was mentioned by Labor.

On the subject of wages Labor demanded "a living wage which shall insure the workers and their families to live in health and comfort in accord with the concepts and standards of American life." The Employers, on the other hand, suggested that the determination of wages must take account of the efficiency of the worker, recognizing "the quantity and quality of his productive effort." They agreed to a minimum wage that should enable the worker to maintain himself and family at a standard of living satisfactory to a right-minded man in view of the prevailing cost of living. Bonus payments, profit-sharing and stock ownership were recommended for consideration. Equal pay for women doing the same work as men was approved by both sides.

Immigration was dealt with only by Labor, which asked that all immigration into the United States be prohibited at least until two years after the declaration of peace. It was further declared that the flow of immigration should at no time exceed the nation's ability to assimilate and Americanize the immigrants, and that immigration should always be prohibited when an abnormal condition of unemployment exists in the United States.

An effective method of dealing with the high cost of living was sought in a resolution by Mr. Russell of the Public Group calling upon Congress to pass an anti-profiteering act similar to that of Great Britain.

The shortest resolution offered was that of Mr. Fuller Calloway of the Employers, as follows: "Resolved that individual initiative and enterprise should be encouraged." Despite its brevity this resolution embodies a principle which is a matter of contention between workers and employers. It has been claimed that labor organizations tend too much toward standardization of the job and the individual and the output, without providing for or recognizing the necessity of offering incentives for greater effort or superior ability on the part of individuals. After offering his resolution Mr. Calloway spoke at some length on the system adopted in a cotton-mill community at La Grange, Ga., where various co-operative schemes have been in vogue between the employer and employees, including provision for education, health and hygiene, and recreation, as well as a scheme for profit-sharing.

Request for Census Data

Of fundamental importance was a resolution by Mr. Loree of the Employers asking that Congress take necessary steps to secure information on our population, employed and unemployed, male and female; home and foreign income; wages, hours of labor, salaries and profits of the principal industries; surplus and depreciation; taxes, royalties, rents, interest, advertising; reserves necessary for the progress of an increasing population and the spendable income of management and capital. It was urged that full advantage be taken of the census of 1920 in securing much of this information.

The Employers' program was more comprehensive than that of the Labor Group and was considered also by many to be more progressive. It naturally gave more attention to the function of Management in industry than did the Labor program, for Labor regards Management as a side partner with Capital and not as an intermediary responsible to both Capital and Labor. The Employers also preferred to consider the individual establishment rather than the industry as the unit in which industrial relations should be fostered and improved. Where Labor contends for the unionization of an entire industry and the settlement of wages, hours of labor and conditions of employment throughout that industry, the Employers suggest that better results can be obtained by experimenting in the establishment. On the subject of wages, Labor wants all of the workers' reward to be paid as wages and not as additional compensation in the form of profit-sharing, bonuses and stock ownership.

On the subject of the open or closed shop the Labor Group made no proposition, but the Employers declared for the open shop "in which membership or non-membership in any association is not made a condition of employment." They also declared that "coercive methods aimed at turning the 'open shop' into a 'closed union' or 'closed non-union' shop should not be tolerated."

On the subject of strikes and lockouts the Employers again made a declaration without a corresponding one from the Labor Group being offered. The Employers distinguished sharply between employment in the field of private industry, in public service and in Government service. The nature of Government service and that of the utility corporations was regarded as sufficiently different from that of private industry to warrant the prohibition of strikes on the part of workers engaged in such work. "A strike of Government employees is an attempt to prevent the operation of government until the demands of such employees are granted, and cannot be tolerated." On the other hand, "the right of Government employees to be heard and to secure just redress should be amply safeguarded." The sympathetic strike was condemned, as was the blacklist, the boycott and the sympathetic lockout.

Labor Seeks Action on Steel Strike Resolution

Adjournment of the Conference at the end of the first week of its deliberations came in a rather dramatic way and showed clearly that there was a deadlock, temporarily at least, on the issue of attempting to settle the steel strike. Various members of the Conference had previously addressed themselves to the proposition that the resolution was not germane to the purposes of the Conference, and stated that it should not be considered. The Committee of Fifteen, however, had to consider it, under the rules, and report it in some way or other to the Conference. The chairman of this committee reported on Friday afternoon, Oct. 10, that the steel strike resolution had occupied the attention of the committee for some hours and that no report of substance or merit could be expected without further work. An adjournment was moved until the following Tuesday morning. Mr. Gompers, however, was loath to see the resolution go over till the next week, and suggested a shorter adjournment, which was finally agreed to. It was quite evident that Labor was banking heavily on the action of the Conference on this resolution and wanted early action. Adjournment for one hour was then agreed to, but at the end of that time the General Committee reported in favor of adjournment until Tuesday, as in the first instance. It was apparent from this action, without further announcement, that the committee had been unable to agree on a report on the resolution to settle the steel strike, and the Conference was adjourned.

American Petroleum Institute

Plans whereby the American Petroleum Institute will spend at least $500,000 annually for research and statistical work practically have been completed. The proposed organization of the Division of Research and Statistics submitted by Dr. Van H. Manning, the director of the Bureau of Mines, has been approved and will be put into effect in the near future, it is understood.

The division is to be under the general supervision of a technical director. His chief assistants are to be an economist and an engineer. The economist, in addition to studying the economic phases of the industry, is to have charge of statistics. The engineer will be in charge of research. It is the intention to concentrate in the Institute all statistics regarding individual operations from which generalized statements can be made to the Government or for publication. The statistics will go deeply into the matter of prices of crude oil, refined products and natural gas. Economic studies are not to be confined to the United States but will extend to foreign countries. So that work may be thorough, agents will be located in important foreign commercial centers. Steps will be taken to bring about uniform cost accounting and uniform laws and regulations.

Under research the division will take up studies of production, chemical engineering, utilization, and work on special problems. In the matter of chemistry it is admitted that an almost unlimited field is presented, but at the start the work will be concentrated largely on the selection and correlating of chemical information pertaining to oil and natural gas. Among the problems which are to receive early attention are: Recovery of spent acid in refining gasoline and kerosene; development of more efficient distillation methods for very closely refined products and a more efficient recovery of uncondensed gases from the stills. Cracking processes also are to be studied with regard to chemical engineering and general economy.

The Dangers of the Postal-Zone Law

By Arthur Capper
U. S. Senator from Kansas

THERE is no subject of greater importance to the public than that involved in the postal principles on which is based our postal legislation. The present postal-zone law needs careful consideration, and every citizen and home throughout this nation should earnestly endeavor to understand the important factors involved.

For there is no function of government that reaches every citizen and every home to the extent of our United States postal service. For over seventy years the history of our postal legislation shows that our country has not legislated for postal service on the basis of cost, because the postal service is of such universal benefit, is such an instrument of information and education and unification, that to restrict it in any way is to hurt the country that we as thinking citizens wish to serve. So clearly and firmly has this American postal principle been held, that postage cost must not determine the postage rate, that our post office has delivered letters and publications to Yankee whaling ships at Point Barrow in the Arctic Circle for two cents that cost over $5.60 to deliver. I would ask any thinking citizen if it is not just as important that a Yankee skipper home from a whaling cruise shall be able to understand and vote intelligently upon the great public questions of the day as it is for the citizen who has stayed at home? This principle is sound. Shall not California, Kansas and Maine have equal postage on all information as an American right?

Our rural free delivery system—the most expensive and least revenue-producing branch of the post office—costs 1½ cents per piece of mail matter, and this 1½ cents is over and above the cost of collecting, sorting, handling, transporting and rehandling until it gets into the rural free delivery carrier's wagon. This has all been done upon the American postal theory that the post office function was a service to the American people and that the cheapness of postage was a benefit to the American home.

It has been alleged—and maybe some have fallen victim to its un-American and illogical absurdity—that cheap postage on magazines and newspapers is a subsidy to the publishers. It is not a subsidy to the publishers. It is, if you want to use the term "subsidy," a subsidy to American readers. You can determine this for yourself. Who receives the benefit or subsidy when the Yankee skipper of a whaling ship off Point Barrow, in the Arctic Circle, receives news from home which costs $5.60 to deliver? Is that a subsidy to his home newspaper, his periodical or magazine, or is the benefit of that to the ship captain himself and his citizenship and our united and national standards of intelligence?

You will instantly recognize that it is this ship captain receiver of costly postal service who is benefited, and your common sense will instantly prove to you that in every case of cheap postage the primary and entire benefit is to the receiver. Would you have Kansas pay higher postage than New York merely because any information happened to be printed in New York? Why handicap the postal service of Kansas by a higher and discriminatory postage rate? I come from Kansas, but the discrimination is similarly true of every other State.

Cheap postage on periodicals and newspapers has made the American nation a nation of readers beyond any nation in the world. If there is any thought in your mind that *this* is *not* a national benefit, I ask you to compare in your mind this great country with its splendid and homogeneous American idealism, its singleness of purpose and the universality of its achievements with those nations in the world in which there is but little magazine reading.

Now as a practical proposition. You know the economic law that all costs must ultimately be paid by the final consumer, i.e., in this case the reader. To raise the postage on publications means that the publishers, as business men, must add this charge to the price of their periodicals—and thus lessen reading. Is this a good thing? And again I ask every reader to consider those nations in the world which have never encouraged widespread reading nor the widespread distribution of periodicals and newspapers, and to answer that question.

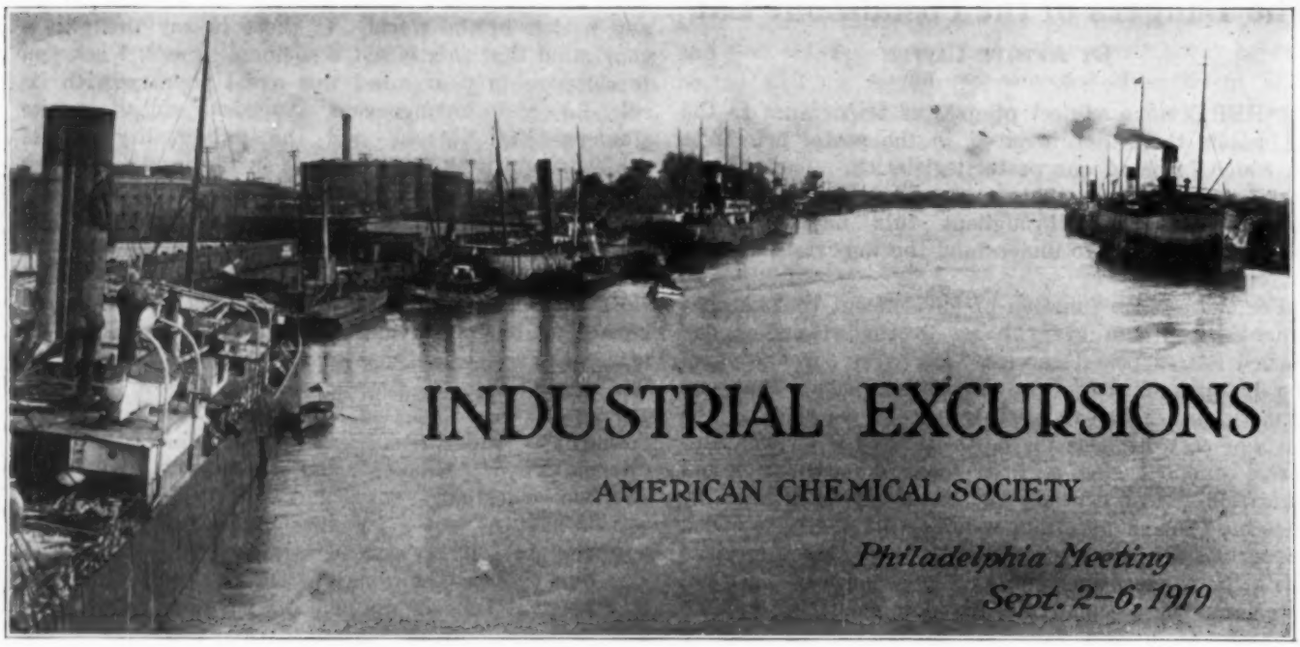
This country had a postal-zone system at one time, applying to letters and newspapers and periodicals. The abolition of the zone system was made complete by President Lincoln in 1863 and the zone system was abolished not only on periodicals and newspapers, but also on letters, because it was regarded as an unsound postal policy and un-American that a citizen or home should have to pay more postage simply by an accidentally greater distance from the point of mailing.

Now on the practical side I wish to point out that the country newspapers have circulation in their county of publication without any postage charge whatsoever and this can only be justified and continued on our American theory that the postal function is an equal service to all American homes.

It would be obviously unfair for those supporting the postal theory that the cost must determine the rate of postage to ask that a letter costing 1½ cents for delivery alone on rural routes should be sent for one cent. I do not have to be convinced that we should have one cent letter postage. I am for cheap postage as a great American social service. I believe that every right-thinking American is for cheap and equal postage. But there is no logical reason for believing that the rate on one class of postal matter must be determined by the rate on another class of postal matter. The figures of postal cost upon which this unsound and un-American postal cost theory is demanded were compiled in 1907 and upon being investigated by the United States Postal Commission headed by the Hon. Charles E. Hughes, these figures were discarded as utterly unreliable in determining the cost of handling newspapers and periodicals. Yet it is upon these discarded cost figures that such unsound arguments are based.

If we must abolish postal service—or increase postage rates to a prohibitive basis—on the theory that cost of service shall determine the postage rates, we should have to abandon many of the most important of our postal functions, the rural free delivery being the most conspicuous example and one which I believe should be kept up no matter what its cost, as it is the most important postal service in the entire department. It pays too high a return—as does every other postal service—in improved and elevated citizenship.

I earnestly hope that every reader will give this postal-zone matter and its revival of unsound postal theories that have been discredited for over two generations very serious thought.



SEVENTEEN of the representative plants of Philadelphia acted as hosts on the afternoon of Sept. 4 to the members attending the fifty-eighth meeting of the American Chemical Society. Thus a choice was given of seeing one of the elite of the following industries: petroleum, leather, storage batteries, lime, coal-tar products, rare earths, paper,[1] printing, gas, paint, rubber, sugar, phonographs, antitoxins and water. Many of these proved to be of exceptional interest and are therefore included in this continuation of the erport of the meeting.

The Atlantic Refining Co.

The works of the Atlantic Refining Co. occupy an area of one square mile, or nearly 1 per cent of the city-county of Philadelphia. Two hundred and fifty-odd stills equipped with condensers and varying in capacity from 600 to 1250 bbl. make up the actual equipment inventory along with 4000 tanks holding up to 55,000 bbl., 825 automobile trucks, seven 11,000-ton tank steamers, hundreds of miles of pipe lines and pumps to correspond. Eleven thousand employees seem to be a small force with which to operate such an enormous works, but everything is done mechanically, with a minimum expenditure of man power. The present equipment capacity is about 45,000 bbl. of crude oil per day, which is received through 8-in. and 6-in. pipes from the various Pennsylvania, West Virginia and Mid-continental oil fields. Various grades of crude are shot through the same line one after the other without having as much tendency to get mixed up as is often exhibited on our rail transit lines. Schedules are made and kept. The arrival of the new crude supply means the quick shifting of a few valves to place it in the right tank, as its analysis has been wired in from its point of shipment and a tank has been provided.

Refinery Practice

There is considerable variety in the practice of petroleum distillation, owing principally to the variations in the crude oils and the specifications of the two hundred-odd products made.

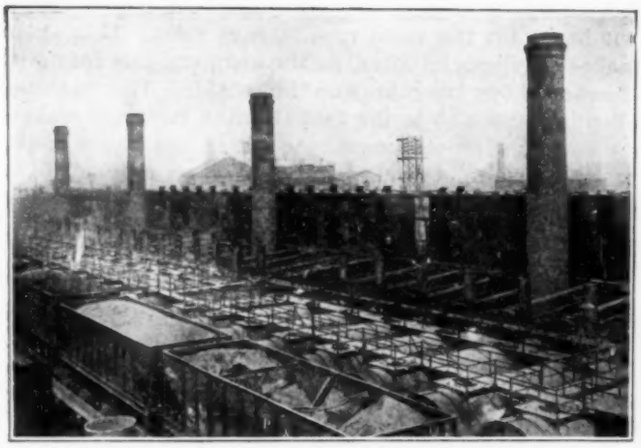
The following is an elementary outline taken on an average of the progressive distillation and treatment of oil. It must be noted at the start that the composition of an oil vapor is dependent on the partial pressures of all the constituents, which in turn are dependent on their vapor pressure and concentration in the liquid. For this reason the first distillate, called crude benzine, has a little of the whole paraffine series. However, a fractional condensation is made which segregates fairly well the gasoline hydrocarbons from pentane to nonane; the naphtha, from decane to tridecane; and the kerosene, on up to octadecane, etc. Of course all fractions are controlled at the gravity testing house, where hourly Baumé records are kept and the oil piped to the right tank. The speed of the vapor is very great at times, for often 50 bbl. of oil is taken off of a still per hour. For this reason some tarry matter is trained over, which is removed together with unsaturated hydrocarbons by agitating with 66 deg. oil of vitriol in a large vertical lead-lined tank built along the design of a separating funnel. After the acid sludge is drawn off, the oil is neutralized with caustic soda solution, washed with water and steamed.

If the petroleum is a paraffine base, lubricating stock and the waxes begin to come over as soon as the light oils have stopped and the temperature of the still raised. It should be noted that practically all the stills are heated with fuel oil steam jets except in the latest installations, where fine coal screenings are fired with stokers. No arches are used with this type of heating. At first some trouble was found in the combustion gases from the fuel oil condensing on the cold still, but by lowering the fire zone this was overcome.

Evidence that the ordinary distillation process is not one of mere physical separation is found in the fact that if the paraffine residue is chilled, an amorphous non-crystalline solid segregates which is separated and refined under the name petrolatum, vaseline, etc. If this same fraction had been distilled, and the distillate chilled, hard paraffine wax would be the result.

Wax tailings are the last paraffine fraction, leaving coke in the still. Petroleum coke is one of the purest forms of carbon, and is used in making carbon elec-

[1] Dill & Collins Paper Mills, pp. 370-375, Sept. 15.



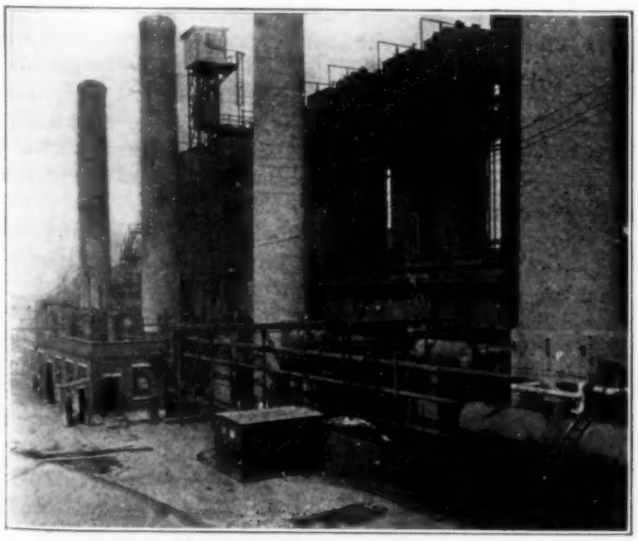
HIGH PRESSURE HORIZONTAL BURTON PROCESS STILLS

trodes. Being free from silica and low in sulphur, it makes an ideal reducer for such metals as aluminum, magnesium, etc., in the electrolytic reduction processes.

Of recent years the Mexican asphalt base crudes have been playing an ever increasingly important role. The light top fractions are taken off in a similar manner to the paraffine crude. The topped residue may be distilled up to 700 deg. F. and sold for fuel oil. If flux oil is desired, the residue is blown with air to dehydrogenate and polymerize the oil hydrocarbons into asphalt. If the air is applied for a sufficient period, the highest grades of asphalt may be produced of any desired melting point or penetration.

The Burton Process

Many unsuccessful destructive distillation inventions have left their only trace in the files of the Patent Office, thus giving evidence that they grew to be no bigger than an original idea. James Young, Benton, and Dewar & Redwood, all have their supporters as being the real inventors of the destructive distillation of oil, though it is perfectly well known that they could not work the process commercially on account of their lack of equipment facilities. While the original Burton process was eventually operated successfully, it fell to the part of Clark, Hopkins and Humphreys to furnish several much needed improvements. A view of the battery of old horizontal direct-heated stills is given.

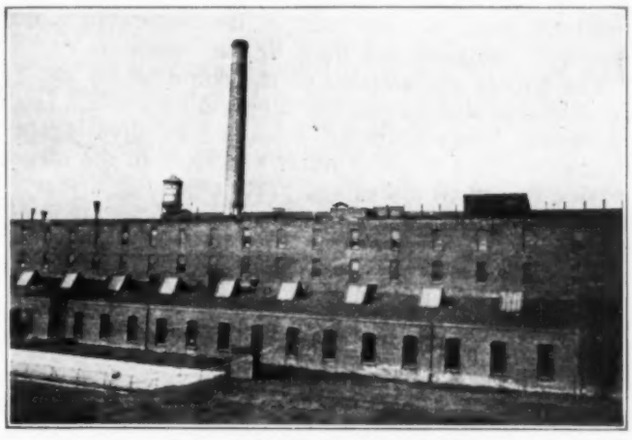


HIGH PRESSURE VERTICAL BURTON PROCESS STILLS

Coke deposit formation, with resulting overheating of the still in spots, made it necessary to drop the pressure of the vapors lower than desirable. Clark evolved the vertical boiler tube heater in conjunction with the tall vertical still towers. Boiler tube cleaners are used to cut out the coke layers at the beginning of each run, and in this way a pressure of 100 lb. can readily be obtained, with a corresponding high yield of cracked gasoline. The gases obtained are stored in regular gas holders and used for fuel within the works.

Robert H. Foerderer

At the plant of Robert H. Foerderer, the manufacture of vici kid was observed in the factory which grew to gigantic dimensions during 17 years of patent monopoly and well deserved popularity. Dry salted goat hides in bales of 500 are received, principally from Arabia, India and China. These are sorted, washed, soaked in water to soften and defleshed with scrapers. The hair is removed by leaving the hides several days in vats of old depilating lime liquor, which has be-



"THE HOME OF VICI KID"

come well inoculated with bacteria. The latter act on the embedding skin cells around the hair roots in such manner that when the hide is immersed in fresh lime solution for several days, ammonia is formed, the hides float up and the hair roots become disengaged. After passing the hides through rollers mounted with spiral scrapers to remove all the hair, they are delimed by soaking several days in oropon solution (ammonium chloride and dry hog pancreas). The soluble salts are then washed out, leaving a very porous skin structure saturated with neutral wash water. The hair obtained is graded, the different qualities being used in weaving rugs and carpets, making harness pads and reinforcing plaster.

The two-bath chrome process used for tanning the skins consists of soaking the skins for several hours in a solution of sodium bichromate and muriatic acid in the proportion of 6 and 3 lb. each per hundred of skins. The reaction is:

$$Na_2Cr_2O_7 + 2HCl = 2NaCl + 2CrO_3 + H_2O$$

After the skins have become well yellowed with chromic oxide all the way through, they are greened by soaking in a reducing solution of hypo. This reaction is in three stages:

$$2CrO_3 + 6HCl + 3Na_2S_2O_3 = 3Na_2SO_4 + 3S + Cr_2Cl_6 + 3H_2O$$

$$Cr_2Cl_6 + Na_2S_2O_3 + H_2O = Cr_2(OH)_2Cl_4 + SO_2 + S + 2NaCl$$

The basic chloride is then converted to $Cr_2(OH)_6$ by washing in sodium bicarbonate.

The skins are now dyed, fat-liquored, dressed and glazed, finally being measured in an ingenious segment roller machine, inspected, graded and shipped.

The coated leather department was not visited, though fine specimens of this modern type of leather were exhibited at the office of the company.

The Electric Storage Battery Co.

The plant located at Nineteenth and Allegheny Sts., Philadelphia, is said to be one of the largest of its kind in operation today. The raw materials consist chiefly of pure lead, antimony lead in pigs, sulphuric acid, litharge, red lead, lumber and packing materials. Finished products such as glass jars for small batteries and rubber jars in all sizes are purchased from other manufacturers.

The visitor is immediately impressed with the extent of the lead-working activities, which embrace the larger part of the manufacturing establishment. All battery plates and fittings, terminals, busbars, connections, lugs, etc., are cast in hand-operated molds especially designed and built by the company.

The frames and sections of the plates which will be subjected to stress or strain in operation are cast from antimony lead wherever feasible, to give proper strength. This is particularly practiced in the larger sizes. The small plates and parts adjoining or carrying the activated material in the large plates are made from pure commercial lead, which is later burned to the antimony lead supports in assembling.

A noteworthy item in connection with the lead burning is the type of flame used. It was found unnecessary to employ the intense heat of the oxy-acetylene flame in this work, and the company therefore installed its own water gas plant. Water gas and oxygen are ignited in the torches. Other chemical plants having a considerable amount of lead burning to do might effect a saving through this feature.

There are two general types of grids made: The pasted grid, made up with a sort of mesh into which the red lead is plastered by hand to form a smooth surface, and the button or Manchester grid, which consists of an antimony lead plate punched with holes about $\frac{3}{4}$ in. in diameter. These holes then receive a button or roll of pure lead corrugated ribbon forced into place by hydraulic presses. This ribbon is made by extruding lead from the cold ingot at a pressure of 300 tons, resulting in a dense product. Large rolls similar to those employed in steel mills make the sheet lead from the pig for use as battery box linings.

The department for the making of wood separators used between plates covers considerable space and consists mainly of chemical processes. Cypress, cedar or California redwood is used and is first placed in a bath of hot alkali for several hours. From this it is taken through tanks involving about 20 operations which were not revealed to the visitors. The purpose of the process is to make the wood resistant to deterioration in the sulphuric acid bath of the battery.

The pasting of red lead on the grids is carried on by hand with a large number of workmen. The material is damp so there is little dust to cause lead poisoning. The men are required to have special suits of clothes furnished by the company and are forced to take at least one shower bath each week.

There is a large wood working plant which turns out boxes for the wood type storage cells. This shop makes only special sizes, as the company has found it cheaper to buy the others on the outside. The machine shop is large, due to the fact that the company makes its own factory equipment as well as the small metal parts, other than lead, for the battery outfits. The steel and copper parts are lead plated before assembling.

A variety of operations are carried on in the assembling departments. The individual plates are gathered in small racks where the busbars connecting a set for each cell are put on by the lead burners. The busbars are cast in hand molds in the same department. The sets thus formed are placed in the boxes which have been previously constructed and painted with asphaltum paint, in case of wooden containers, and the covers put on. The mechanical part of the cell thus completed is taken to the charging or activating department.

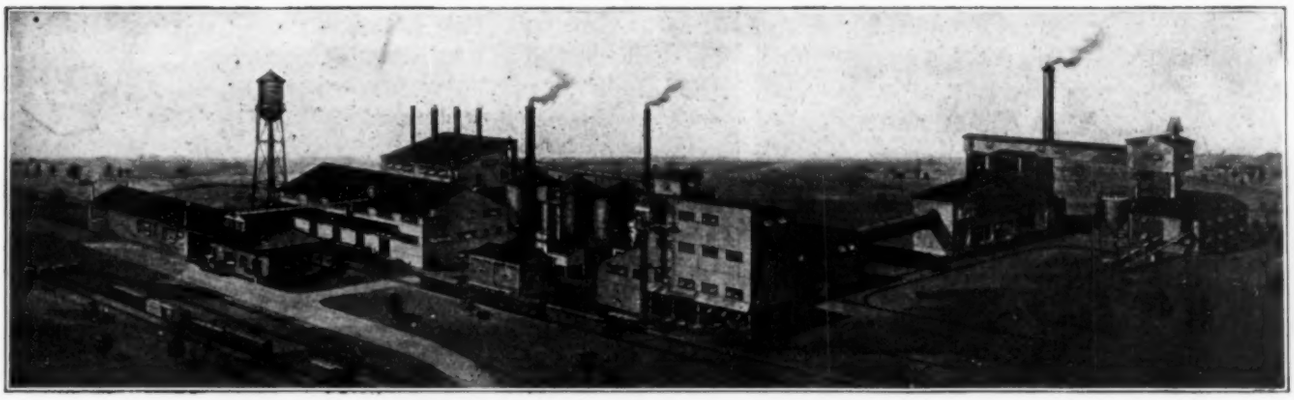
Several large rooms are in continuous operation where the acid is placed in the cell and the charging is carried on. Other large batteries of tanks are subjected to current for activating unassembled plates. The current for this work is supplied from a 2000-kw. steam-power plant supplemented by three substations receiving an additional 2500 kw. in power from the Philadelphia Electric Co.

The visitors witnessed the complete process of manufacture of several types of storage cells. One of these was the lighting set made for the Cadillac automobile, said to be one of the best turned out by the company. Another was a glass jar, 16 cell, farm lighting set built with the view of being assembled and put in operation by the layman. This set contains a pilot cell with a depression molded in the glass side about an inch in width and extending vertically along a part of the height. When the battery is in operation a composition ball of proper specific gravity floats in this slot, forming a hydrometer. When the ball is near the bottom of the slot the operator knows it is time to start his generator and when near the top the completion of the charge is thereby indicated.

The cell most worthy of mention, however, is that manufactured for submarine boat propulsion in the U. S. Navy. This cell is made with extreme care under the vigilant supervision of Government inspectors, who carry on exhaustive tests to determine its performance on completion. The large units are assembled in rubber jars, the completed cell weighing 2200 lb. Each battery for the new S type submarine is made up of 120 of these cells arranged in two equal groups for either independent or combined operation in propelling the boat.

The laboratories include a chemical laboratory, in which all raw materials are analyzed; a process laboratory, in which manufacturing methods are perfected; a research laboratory, for development work; a commercial laboratory, in which batteries are tested to determine their characteristics and life, and an engineering laboratory, in which auxiliary apparatus is developed and tested.

A thorough study of the work done in this plant would be well worth the time of anyone interested in either mechanical operations or electrochemical work relating to the operation of the storage battery.



HYDRATING AND ROTARY LIMEKILN WORKS

Cedar Hollow Limekilns

Three types of limekilns are operated in the Cedar Hollow plant of the Charles Warner Co. at Devault, Pa., the visit to which proved to be very instructive as well as a delightful excursion of 30 miles up the Chester Valley. For the benefit of those who think of the burning of limestone in the simplified symbols of $CaCO_3$ less CO_2 produces CaO with a little thermo and equilibrium chemistry thrown in, these few notes are designed to furnish somewhat of an appendix to their knowledge.

The decarbonating process of the dolomitic limestones begins as low as 660 deg. F. After all the CO_2 has been removed, which is around 2100 deg., the lime begins to harden. Only about 1½ per cent of acid fluxes (SiO_2, R_2O_3) are present in the raw stone, which reduces the tendency to sinter, but the lime structure apparently changes, becoming less porous, at a rate increase proportional to the magnesia content. The stone at the Cedar Hollow quarry is dolomitic, the ratio of lime (CaO) to magnesia (MgO) being very close to 3 to 2. This is very important in connection with the slaking properties of the product. Pure calcium oxide, as is well known, has to be added to its slaking water, because it is so porous, and thus reactive, that it will "burn" itself with the heat of reaction of the hydration. Probably this so-called "burned slaked lime" is a lower hydrate; at any rate, it is non-plastic, gritty, and cannot be used for plaster.

On the other hand, a dolomitic burned lime, being of a denser structure, can safely be slaked by adding water to it. This is a very desirable feature in the building trade, as it makes it easier to regulate the consistency and quality of the lime paste.

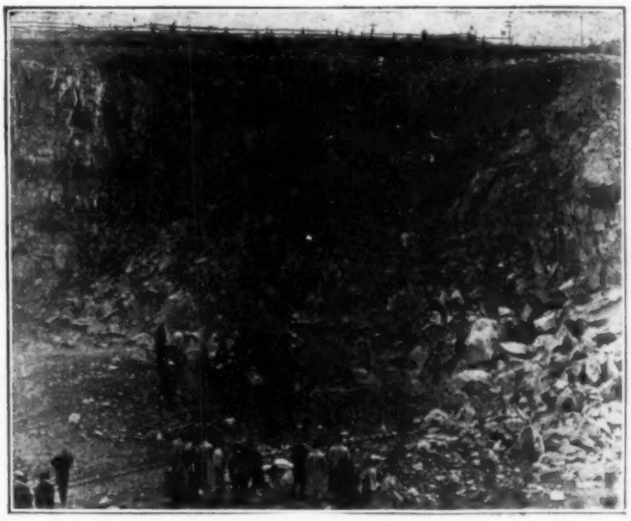
However, another peculiarity should be noted, and that is that if hard burned dolomite is added to a large bulk of water, the slaking reaction is very slow, because sufficient heat is not spontaneously generated to give the temperature required for the high-velocity reaction throughout the mass. Variations in the degree of burning, soft, medium and hard burned, depend on the period of firing, and, in turn, the size of the rock and the type of kiln.

The terms dead, hard, medium, and soft burned, as applied to calcined dolomite and magnesite products, are primarily descriptive from a chemical activity point of view. Neither pure CaO nor MgO is fusible at atmospheric pressure, for their boiling points are below their melting points. However, on the same physical principle as exhibited in the case of alloys, etc., their melting points, or better, softening and cohering temperatures, are lowered by the association with foreign materials. In the case of magnesite, it has been found necessary to have several per cent of ferric oxide present to produce a dead burned refractory of dense enough structure to withstand slag corrosion. The same reasoning is applied in using a soft burned pure CaO for fluxing ores, for it has a porous structure, the pores being the space occupied by the CO_2 burned off, and offers a maximum reaction area to the silica, phosphate, etc., to be slagged. Thus it will be seen that the physical structure of these materials is of primary importance and that it is dependent on the chemical constitution together with the heat treatment given.

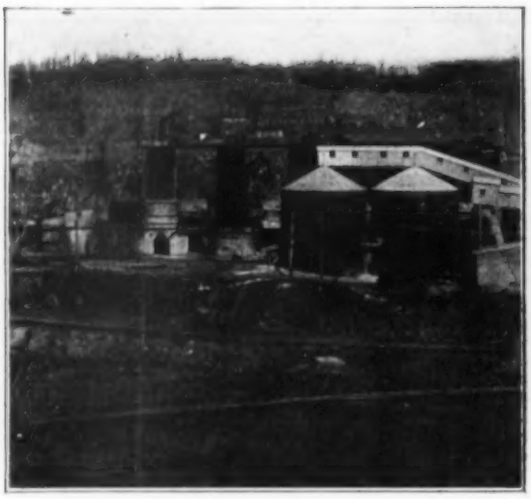
Cedar Hollow Quarry

The quarry has been worked on a 40-ft. face over an area of about 25 acres. Recently a drainage tunnel about 800 ft. long was cut in so as to carry off the water from the second level, which will be 50 ft. lower than the floor of the original quarry. Better quarrying conditions cannot be conceived, as a floor of several million tons of virgin rock has been stripped of overburden and drained of surface water at what might be called a cost too negligible to take into account.

In the run-of-quarry blasted rock, all gradations of sizes are produced. Stone for lump lime, known as "one-man stone," i.e., pieces that can conveniently



QUARRY AFTER A BLAST



15-TON KILNS AND STORAGE TANKS

BATTERY OF SEVEN 10-TON VERTICAL KILNS

be handled by one man, are hand picked in the quarry and loaded upon quarry cars for transportation to the kilns. For best results in burning, a kiln charge must be fairly uniformly sized so as not to get too hard a burn with smaller pieces and at the same time leave no carbonate centers in the larger ones. The large rocks are broken up into "one-man stones" and graded to size.

The smaller pieces of stone, known as spalls, are crushed in a gyratory to pass a ¾-in. mesh screen. The material running less than ¾ in. goes to the pulverized stone plant, where it is dried in a direct-fired rotary drier, pulverized in a Fuller-Lehigh mill and bagged through automatic packers. Over 85 per cent will pass 100 mesh. The pulverized stone is used in agriculture to counteract soil acids and to increase the porosity of heavy clay land. Of recent years great amounts have been used in filling tar and asphalt pavements. The ¾-in. stone is burned in a rotary kiln and slaked at the hydrating plant.

Types of Kilns

The present equipment consists of seven 10-ton vertical brick, two 25-ton vertical brick, seven 15-ton steel jacketed kilns with direct coal firing, also one 50-ton vertical steel jacketed, and one 100-ton rotary kiln, each fired with producer gas. A vertical Mount kiln with rotating base is now in the course of erection, which is expected to increase the output 100 tons per 24 hr. of firing, thus giving a daily production of about 450 tons per day of burned lime.

The rotary kiln is used to burn the smaller sizes of stone, making the conversion in 2½ hr. Due to the short time of firing, the product is very soft and slakes quite rapidly, not having had time for the magnesia-lime condensation reaction referred to previously. It is pulverized and then slaked in a machine which proportions the correct amount of powdered lime and water conditions most favorable to give a high quality of product—called by the trade name of "Limoid."

Surplus burned lime product from the vertical kilns is mixed with the rotary product and the resulting mixture is used in making "Limoid" (hydrated lime). All Warner hydrated lime is seasoned in steel tanks for at least three days before finishing and shipping.

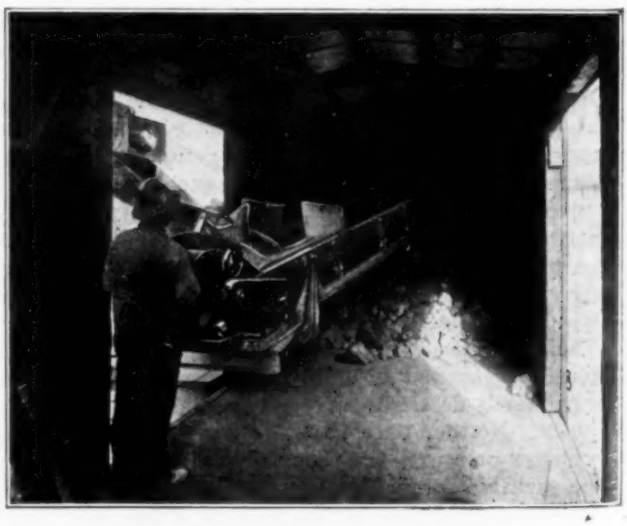
To produce a super quality of hydrate, the burned lime is specially hydrated and then finished in an air pulverizer, so that there are no tailings in the finished material. This is called "Kreme-Kote" and is used for high grade finishing plaster.

The vertical kilns are used for making lump lime and require from 24 to 72 hr. for conversion to medium burned lime having easily regulated slaking properties. The trade preference in some localities for lump lime was established in the days when the stone was burned directly with wood and coal fuel. Ancient practice was to sort out all the clean lumps, and sell the smaller pieces along with the fuel ashes for fertilizer. However, as a rule, small sizes usually indicated overburning with corresponding slaking trouble on the job and the trade now refuses to take time to investigate by running any slaking tests.

As long as there is an appreciable core of unburned stone, lumps in the kiln show dark spots against the incandescent mass. On cooling, lumps containing "core" (center of undecomposed stone) show a pink or salmon pink tint on the surface. Experienced lime men can make an infallible separation between properly burned and incompletely burned lime by this color test. This color test is applicable only to dolomitic lime.

Coal Consumption

Vertical kilns are the more economical in fuel costs, giving from 4 to 5 tons of lime to the ton of coal, as compared with 3 to 3½ tons with the rotary, in spite



MANIERRE BOX CAR LOADER

of the difference in the length of time of heating. Of course the greater production of the latter in proportion to the overhead costs counteracts the difference in fuel cost considerably. However, the Mount kiln should have the heating advantages of the stationary producer gas fired vertical and the controlled feeding of the rotary kiln. Forced firing and fast lime burning go hand in hand, but exit gases over 400 deg. indicate an uneconomical heat leakage, unless greater production must be had because of market activity.

Large steel tanks having a combined storage capacity of several thousand tons act not only as an interdepartment regulator but as a seasonal reservoir. The plant is excellently equipped with conveyors, dump cars and machine car loaders. Fluctuations in shipping from none to 30 cars per day are thus readily provided for. A view is given of the first Manierre box car loader, installed in 1913, at work. The loader itself is an ingenious but simple belt conveyor, so carefully balanced on ball-bearings that one man can easily project it through the car door and into place. The end of the conveyor is raised or lowered so that the first lime charged into the car is deposited easily on the car floor with a minimum of breakage. As the pile builds up, the end of the conveyor is raised so that the drop of the lime is always a minimum.

The Barrett Company

The Frankford, Philadelphia, Works of the chemical department of the Barrett Company has grown out of the business originally started in 1884 by Dr. H. W. Jayne. In 1886 Dr. Jayne formed the partnership of Jayne & Chase, manufacturers of fine chemicals.

In 1887 the H. W. Jayne Chemical Co. was incorporated, specializing in refined coal-tar products such as naphthalene, carbolic acid, benzol and nitrobenzol.

In 1896 the H. W. Jayne Chemical Co. was one of the companies which formed the Barrett Manufacturing Co. Dr. Jayne was appointed manager of the Frankford plant, and held that position until his death, in 1910. The business in refined products from coal-tar has grown steadily along the lines originally laid down by Dr. Jayne. Many of the processes in use at the present time were worked out by him.

The plant has grown from a very small one, covering about three acres, to the present works, covering 17 acres.

An extensive research laboratory is maintained for the development of new products and the perfection of old processes. Practically the entire plant has been rebuilt during the last four years. To-day, with its up-to-date power plant, fire-fighting equipment, service buildings, dispensary, shops, etc., it is representative of the most modern type of chemical works.

The Frankford Works is essentially a refining plant and does not handle any crude-tar distillation. One of the principal processes is fractional distillation, the plant having an equipment of 35 column stills, varying in capacity from 1200 to 10,000 gallons.

In the distillation of coal tar several fractions are cut, the actual operation being somewhat different for different plants. In general the first cut obtained is known as light oil and contains all of the benzol, toluol and xylol in the tar and some of the tar acids, pyridine bases and naphthalene. The second fraction, or carbolic oil, contains almost all of the naphthalene and tar acids and the bulk of the pyridine bases. The naphthalene is sometimes allowed to crystallize out of this oil and separated by centrifuging as a crude naphthalene. The tar acids are also sometimes extracted with caustic soda and the carbolate so formed decomposed with carbon dioxide, giving crude carbolic acid. The fraction following the carbolic oil is known as creosote oil and is used largely for creosoting purposes. A fourth fraction, known as anthracene or heavy oil, is sometimes taken off, this fraction on cooling crystallizing out a crude anthracene.

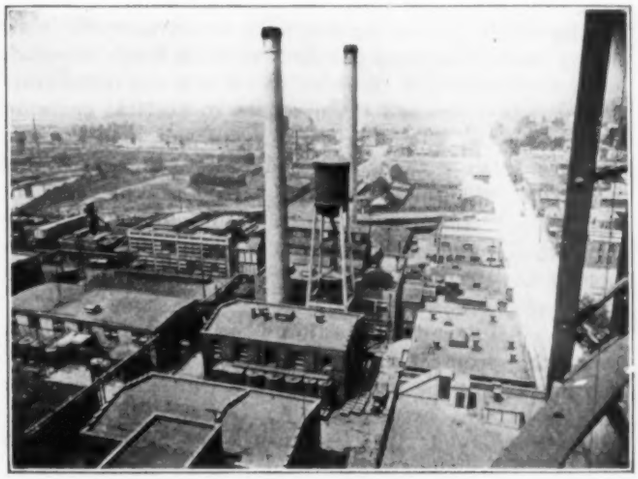
The chemical department of the Barrett Company takes as its crudes, light oil and carbolic oil from other plants, crude naphthalene and crude carbolic acids already removed from the carbolic oil and crude anthracene obtained from the heavy oil. In addition to this there are worked up several miscellaneous oils from outside sources, such as drip oils from gas works, coke oven light oils, etc.

The following discussion attempts to take up the processes as carried out in the various buildings in as nearly as possible the order in which they take place.

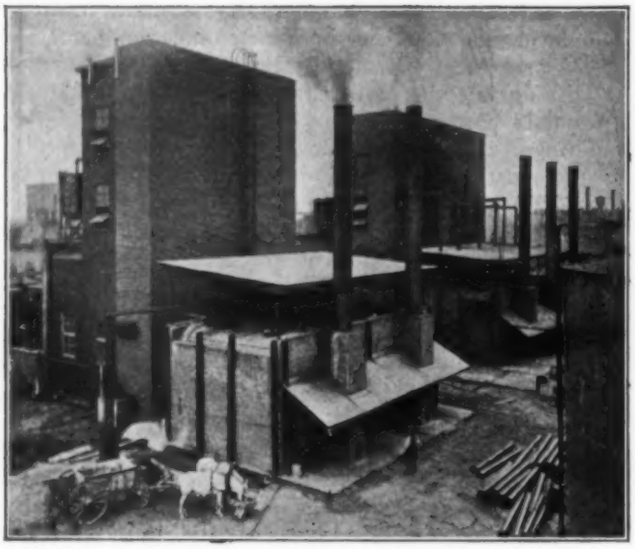
Light Oil Fractions

The light oil department consists of a battery of fire-heated fractionating stills equipped to run under vacuum, the fractionating columns being according to Barrett design, but following the general construction

Ordnance Phenol Naphthylamine Anthracene
Xylol Benzolsulphate Syn. Phenol
Benzol



Naphthalene Stills, Pan House Garage
Packing Power Administration
Crude Carbolic Machine Shops Laboratory



LIGHT-OIL FRACTIONATING STILLS

of containing a number of plates, each plate being provided with a considerable number of cone and bell arrangements, so that the upcoming vapor passes up through the cone and must bubble down underneath the bell through a layer of liquid on the plate. The plates are kept washed down continually by a flow of liquid condensate fed from a partial condenser or dephlegmator situated above the top of the column. The light oil stills form a starting point for the cruder oils received, light oil, carbolic oil, drip oil, etc., being distilled here. The plant produces crude benzol, crude toluol, crude solvent naphtha, which are further worked up elsewhere, and also a fraction from carbolic oil containing nearly all the tar acids and naphthalene. The residue from the stills is a tarry liquid and is accumulated and burned as fuel under the stills.

The distilled oils from the light-oil stills containing naphthalene are collected and allowed to cool in large shallow pans. Here the bulk of the naphthalene separates out and is separated from the oil by draining and centrifuging. The naphthalene so produced is crude naphthalene and is worked up at a later stage.

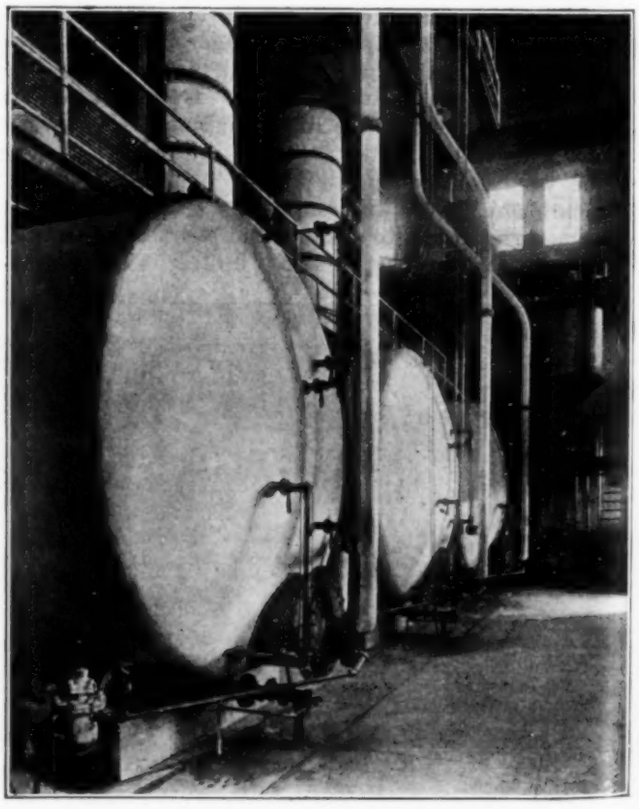
The equipment of the benzol house is a battery of column stills heated by steam and run without vacuum. The plant receives the crude benzol and crude toluol fractions from the light oil stills together with some of the closer boiling light crudes received in the plant. These crude fractions are first given a wash treatment with sulphuric acid in order to remove the unsaturated compounds, the wash taking place in vertical agitators. Following the sulphuric acid wash the materials are given a wash with caustic soda solution to free them from any sulphuric acid and are then charged into the stills. The stills are run to produce pure benzol, pure toluol and intermediate fractions which are redistilled. Products such as 90 per cent benzol are also made here.

The xylol department adjoins the benzol house, being separated from it by a fire-wall. The building and equipment are the property of the United States Navy. The plant was erected during the war to produce a pure meta-xylol for nitration to TNX (trinitroxylol). The stills are exactly similar to the benzol stills, the operation followed out being a distillation of a crude xylol fraction after washing to produce a meta-xylol of very close boiling range.

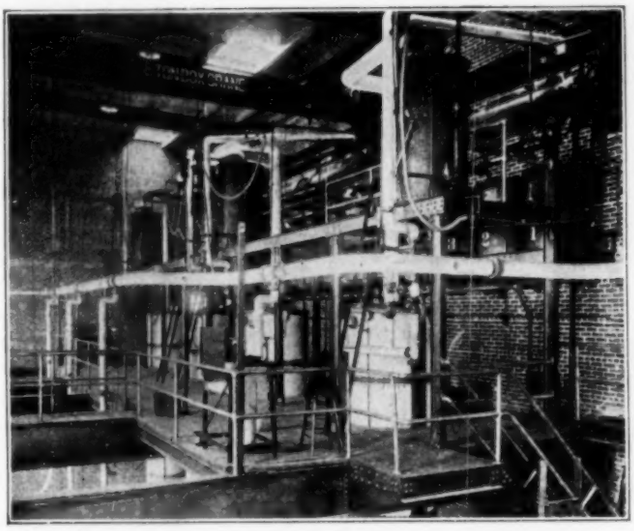
The Cumar plant involves three distinct operations, the first of these being the treatment of the "naphthalene-free" oil from the light-oil pan house for the removal of tar acids and pyridine bases. The tar acids are extracted from these oils in large vertical agitators with caustic soda solution, the carbolate so formed being finally allowed to settle and drained off. The pyridine bases are also extracted in special lead-lined agitators with dilute sulphuric acid. The pyridine sulphate solution so formed is removed in a similar manner to the carbolate. The agitators in this plant are also used for making up the more special tar acid containing oils, such as flotation oil, dip oil, etc., where the tar acid content must be very closely adjusted.

The second operation which takes place in this plant is the treatment of the fractions containing coumarone and indene from the light-oil plant to produce solvent naphtha, hi-flash naphtha and "Cumar" resin. The operation here consists of agitating the fraction to be treated with a small quantity of sulphuric acid, this treatment producing a polymerization of the coumarone, indene and similar materials in the oil. The polymerized product so formed stays in solution in the oil, which is separated from the acid and washed with caustic soda in order to entirely free it from acid. The oil is then subjected to distillation in steam-heated stills, the unpolymerized naphtha distilling over and leaving behind in the still a resinous residue known as Cumar resin. This resin, after all of the volatile oils have been removed by distillation, is drawn out into destructible drums and is ready for marketing.

The third operation carried on is the manufacture of emulsifying disinfectants. These products consist of a coal-tar oil, a soap, tar acids and water. In the cheaper grades of material the soap is a rosin soap, the process for the manufacture of the disinfectant



BENZOL STEAM STILLS; WASHER AT RIGHT



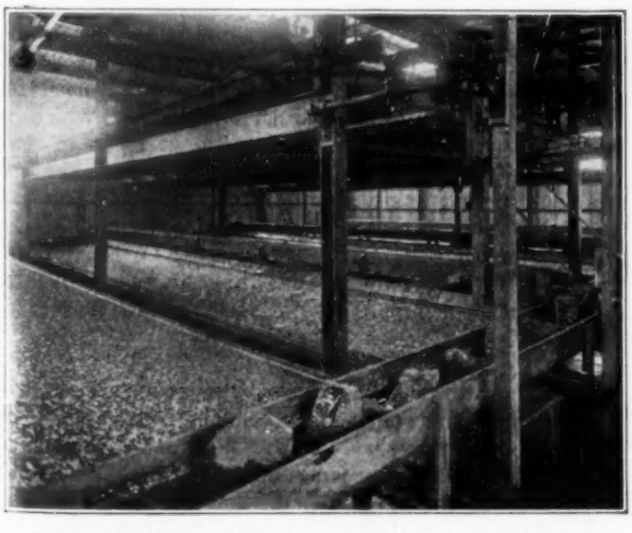
OPERATING PLATFORM BENZOL COLUMNS

being to introduce together into the disinfectant pot the requisite amount of rosin, caustic soda, oil and tar acids and heat until the mixture is entirely homogeneous. The oil used in these compounds is the napthalene-containing fraction after treatment for removal of naphthalene in the light-oil pan house and the freezing plant. For the higher grades of disinfectants the rosin soap is replaced by other soaps.

The object of the freezing plant is to remove the last traces of naphthalene from the naphthalene-containing oils after extraction in the Cumar plant. This is done with a view to obtaining oils which will not separate naphthalene on standing even at low temperatures. The oils are run into brine-jacketed agitators and are cooled down to a temperature of about —20 deg. C., the separated naphthalene being subsequently removed by running the oil through a centrifugal separator.

Crude Carbolic House

In the crude carbolic house the tar acids are recovered from the carbolate obtained in the Cumar plant. The process consists in an evaporation of the carbolate to the required concentration and blowing with carbon dioxide produced in small limekilns. The blowers are run in series, the fresh carbon dioxide entering first into the nearly saturated carbolate. The tar acids so produced separate in a layer and are allowed to settle and are drawn off. The crude acids are prepared for fractionation by heating in a simple still until the water is driven off. The aqueous carbonate solution is recausticized in a small horizontal agitator with milk of lime, the caustic mix so produced being filtered, giving a caustic solution which is used again for extraction of tar acids.



NAPHTHALENE CRYSTALLIZING PANS AND CONVEYOR

Light-Oil Acid Stills

The light-oil acid stills are fire-heated column stills similar to those in the light-oil department and are used largely for the fractionation of crude carbolic acid. The acid is distilled under vacuum and several cuts made containing various percentages of phenol and the cresols and xylenols. The fractions produced in this plant are accumulated and redistilled in the acid stills.

The acid stills consist of a battery of steam-heated column stills equipped to be run under vacuum, and handle the fractions produced in the light-oil acid stills together with some of the more refined crude carbolic acids. The plant produces a crude phenol, crude orthocresol, crude U.S.P. cresol, which is principally a mixture of meta- and para-cresols, together with some of the mixtures of higher boiling tar acids.

REFINED CRYSTALLIZED NAPHTHALENE

Refined Carbolic Acid

In the refined carbolic acid house the crude phenol from the acid stills is subjected to a recrystallization treatment by mixing with a small percentage of water, allowing it to crystallize in ice cans and crushing and whizzing these cakes. The crystals so produced are of a high purity, but contain some water, which is separated from the phenol by a subsequent simple distillation. The cresol fractions are also subjected to a simple distillation in this plant, the principal object being to improve their color.

Naphthalene

The crude naphthalene received from outside sources is melted up in a tank together with the crude naphthalene produced at this plant. The melted naphthalene is run out into large shallow pans in the pan house and allowed to cool slowly, the effect being a recrystallization of the naphthalene from the oil. The solidified naphthalene is broken out of the pans and subjected to the next stage of the process.

The crude naphthalene from the pan house is crushed and subjected to a whizzing treatment, this treatment removing the bulk of the adhering oil. The naphthalene is finally washed in the whizzers with a small quantity of warm water in order to complete the removal of the oil.

The purified naphthalene obtained from the whizzer is charged into fire-heated simple stills and subjected to distillation. The middle fraction of the distillate is accumulated and charged molten into lead-lined agitators with sulphuric acid with the idea of freeing the naphthalene of unsaturated compounds. After the sulphuric acid wash the still molten naphthalene is washed with caustic soda solution in order to free it from sulphuric acid and is then charged into the refined stills and subjected to redistillation. The bulk of the middle fraction from this redistillation is run to shallow pans and allowed to solidify. A portion of this naphthalene is used for subliming.

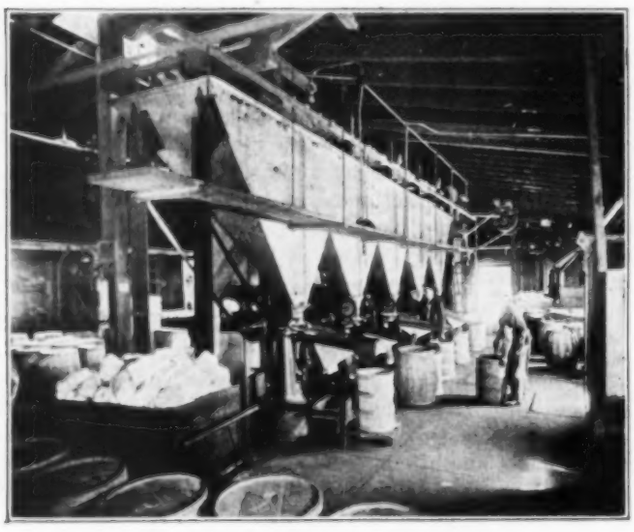
The naphthalene is broken out of the pans, after solidifying, with a pick and shovel and is crushed, the bulk of the crushed naphthalene so produced being packed as such. A portion of this material is run to the ball machines and other special molding machines, and is molded into the various forms demanded by the trade.

Naphthalene Flake House

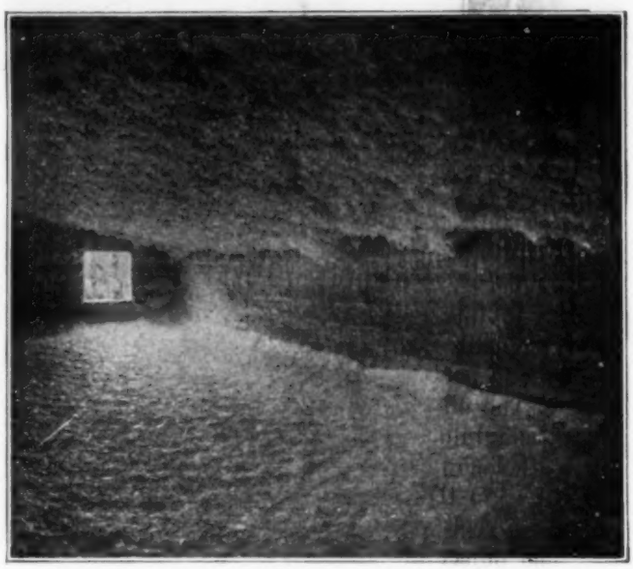
For the production of sublimed naphthalene, the refined distilled product is charged into deep pans situated at one end of the house and heated by steam-coils. The naphthalene sublimes from these into large rooms, where it condenses in the form of flake. These flake houses are run for considerable periods at a time and are then opened up and the flake naphthalene produced shoveled up and packed.

Anthracene Plant

The anthracene plant receives crude anthracene from other plants of the Barrett Company and works it up into refined anthracene and carbazole. The process followed for the purification of anthracene is to wash the crude with solvent naphtha in horizontal agitators, filter the mixture so produced and subject the washed anthracene cake to a similar treatment with pyridine. The solvent treatment has the effect of removing the adhering oil and the bulk of the phenanthrene, the pyridine treatment being principally for the removal of carbazole. The anthracene cake so produced is subjected to sublimation in a fire-heated pot in a current of air, the sublimed anthracene being collected in a large chamber and shoveled up and packed.



NAPHTHALENE BALL MACHINES



NAPHTHALENE SUBLIMING HOUSE

The pyridine liquor obtained from the pyridine wash of the anthracene contains most of the carbazole and is worked up for carbazole by distilling off the pyridine, washing the residue so obtained with solvent naphtha and subliming the crude carbazole so produced. The products of this process are an 80-85 per cent sublimed anthracene and an 85-90 per cent sublimed carbazole.

Synthetic Phenol Plant

The synthetic phenol plant was constructed during the war to supply phenol for the manufacture of picric acid. The process followed was the Dennis-Bull and has been fully described in the chemical journals. The plant has now ceased operations.

Boiler House

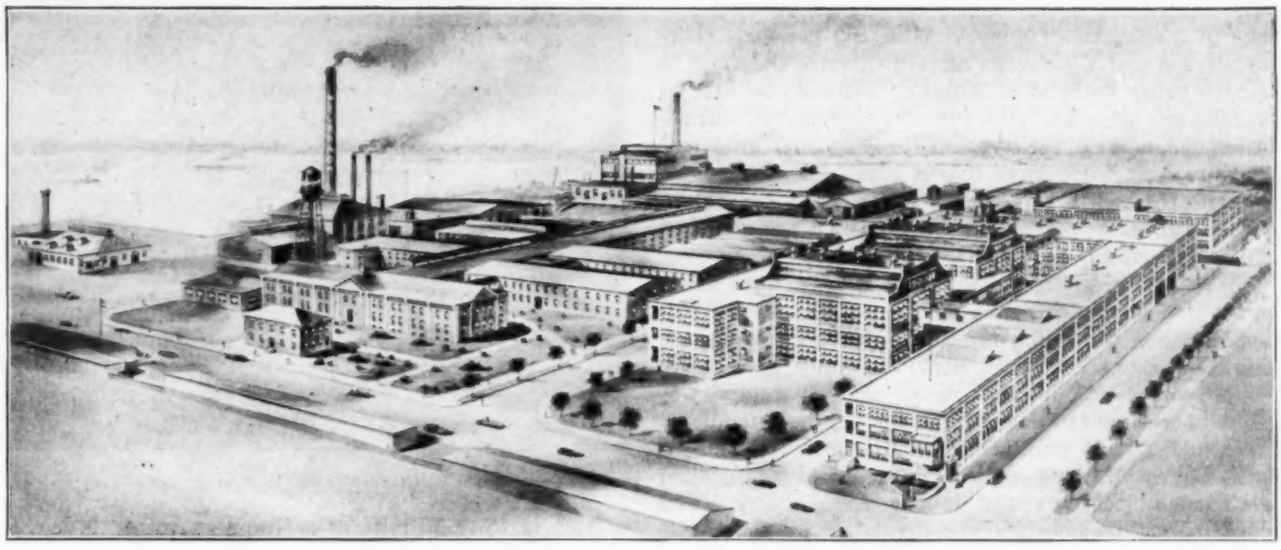
The boiler house equipment consists of four 500- and one 250-hp. B. & W. boilers and one 250-hp. Erie, giving a total boiler-horsepower of 2500. The boilers are equipped with Murphy stokers and with Cochran feed-water heating system.

Filter Plant

The filter plant produces all of the water used for such operations as condensing and cooling which is used in the plant. The equipment consists of two batteries of six horizontal sand filters and three centrifugal pumps and has a total capacity of 6,000,000 gal. per day. The water so produced on account of the filthy nature of the source is not suitable for process work nor for the boilers, for which the plant is also equipped with a supply of Philadelphia city water.

Laboratory

The laboratory building is a three-story structure housing both the routine control laboratories and the research laboratories. The first floor is mainly occupied with offices, washrooms, etc. The second floor is given over to the routine plant control work, and the upper floor is divided into several individual laboratories devoted to research work.



BIRDSEYE VIEW OF WELSBACH CO. PLANT

The Welsbach Co. Plant

The manufacturing plant of the Welsbach Co., located at Gloucester, N. J., just across the Delaware River from Philadelphia, Pa., is a development of many years of commercial operation and chemical research in the incandescent gas mantle industry, and the processes now employed therein are representative of the present state of the art. The manufacturing operations are resolved into three main departments, namely, mantle manufacture, fixture manufacture and chemical production. Each of these departments is subdivided into units, and a thorough inspection of the workings as a whole reveals an enormous amount of detail. The diversity of this detail at once seizes and holds the interest of the visitor.

Mantle Manufacture

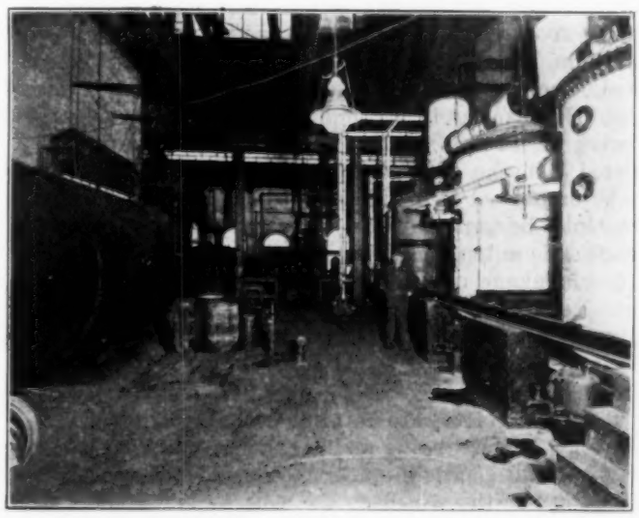
The first step in making the gas mantle is the knitting of the cloth tubing or webbing to form a base for the physical shape of the mantle on which the thoriaceria mixture is to be constructed. This tubing is woven from ramie fiber thread, produced from the ramie plant, similar to linen and a native of India; cotton thread and silk thread. Ramie thread is used for inverted mantles, cotton for upright mantles and silk for the highest grades of either type. Silk is by far the best fabric, leaving the smallest amount of foreign ash in the finished product. Automatic knitting machines, employing both the chain and the rib stitch, weave the tubing into long lengths, made endless by hand sewing, and the diameter of which is considerably greater than the ultimate diameter of mantle desired. This is to allow for shrinking of the structure during subsequent process of hardening. The machines are manufactured by the Wildman Mfg. Co. and the knitting department has a capacity of 20 miles of tubing per day, consuming 1500 to 2000 lb. of thread, or, in other words, enough fabric is manufactured for the production of 1,000,000 mantles per week.

The washing room adjoins the knitting department and the air for both is so thoroughly purified by a Carrier Engineering Corporation washer that it is impossible to detect any particles of solid matter floating in the sunlight as under ordinary circumstances.

The water used in washing the tubing and for dilution of the chemicals so employed is of extreme purity, being continually tested, and if over 5 parts of solid matter in one million parts of water is in evidence, the whole is discarded. This is an important detail, since any appreciable amount of foreign matter entering the flow weakens the finished mantle and causes its rejection by the inspectors. The water is therefore distilled in a J. P. Devine Co. multiple effect apparatus located in the power house and conducted to the various departments through tin lined lead pipe. About 20,000 gal. is consumed daily in the washing process.

The washing room operation requires four days' time to thoroughly cleanse the fabric. The equipment consists of six large circular tanks with smaller auxiliary vats and Troy Laundry Machinery Co. centrifugal wringers. Overhead revolving spools are used to convey the webbing through the process.

After a final neutralization and drying in the centrifugals the material is conveyed to a large Proctor drier, manufactured by the Philadelphia Textile Machinery Co., and remains therein about 25 min. at a temperature of 130 deg. The drying process is continuous, with the material moving along through the dry box on revolving spools.



DEVINE WATER DISTILLING APPARATUS

The saturating department receives the webbing and soaks in a solution of approximately 99 per cent thorium nitrate and 1 per cent cerium nitrate, the time in the bath being from 15 to 30 min. Between 30 and 40 different solutions are used for various mantles and selection depends on the type of product and raw material involved. A colored dye is added for tracing various lots through the factory. The work is carried on in small rubber boxes to the end of which are attached hand wringers, for partially drying.

The wet material from the wringers is cut into 90-in. lengths and slipped over wooden poles by hand. Care must be taken to stretch the mesh of the fabric evenly along the pole. The poles are then hung in a large drying room for a 30-min. period, and where the wet bulb temperature 110 deg. F. and the dry bulb temperature 80 deg. F. is maintained by thermostatic regulation. Curve drawing recording meters are installed at all such locations throughout the factory. The recorders and thermostats are furnished by the Tycos Co. Bristol recorders are also extensively used.

FEEDING TRAYS OF MANTLES TO AUTOMATIC DIPPING MACHINES

The dried lengths are placed flat in bundles and cut to mantle length by rotating knives. The open end of a mantle is dipped in fixing solution by machinery, the drawstrings of asbestos or treated thread are put in by hand and the finished structure is sent to the hardening rooms.

There are two divisions of the hardening department, one for the upright and one for the inverted mantles. Hardening is accomplished by placing over gas flames where a mixture of gas and air is carefully regulated. In the case of upright mantles the regulation is accomplished by hand work of skilled operators over multiple bunsen burners. The burning of inverted mantles is automatically regulated in multiple crucibles. The shrinkage occurs during this process and a 3 per cent loss of product is incurred in the upright mantles, with a 30 per cent loss in the inverted type. This department consumes 160,000 cu.ft. of gas daily.

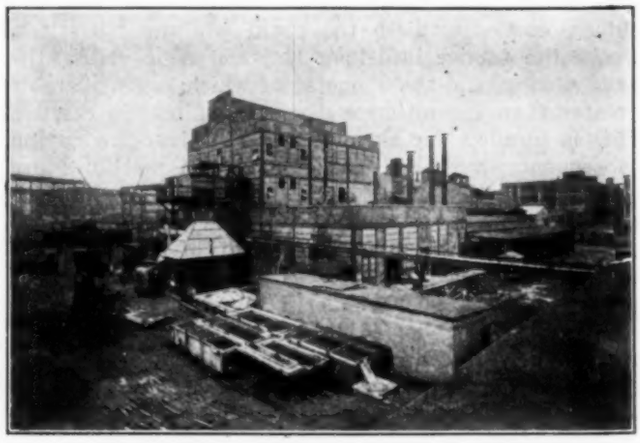
The mantles, now consisting of an ash of thorium and cerium oxides, are carefully conveyed in trays, 100 per tray, to the dipping and packing room. These trays enter the automatic dipping and drying machines, manufactured by the Welsbach Co., where the collodion coating is put on and dried. Time required for this operation is 15 to 20 min. at a temperature of 80 deg. C. This coating protects the ash against breakage until it is burned off in the lamp of the consumer. The department operates four banks of three machines each, and delivers the trays of mantles ready for packing. The collodion fumes from the drying boxes are recovered by small exhausters, shown located over the boxes, and returned to the collodion plant for absorption. An annual saving of about $10,000 is effected through this feature.

ELECTROPLATING DEPARTMENT

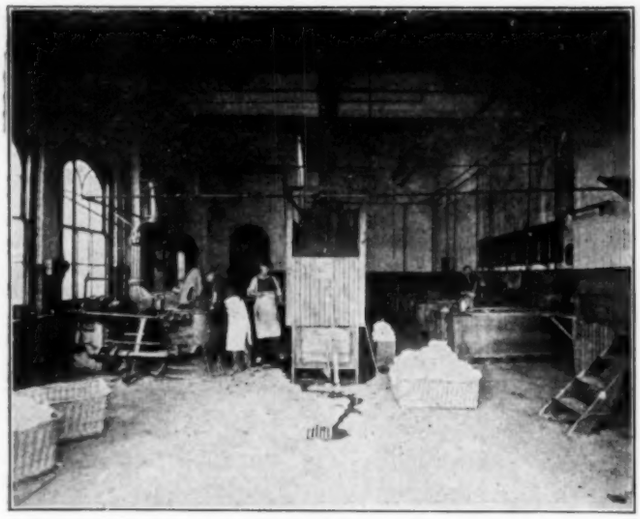
The packing and assembling of the finished product embraces a complete system of belt conveyors and elevators for delivering the numerous types of boxes to overhead bins and for placing the finished package in the shipping department. The best grades of upright mantles are placed in nichrome wire supports before packing.

As the packing is in progress the preliminary inspection is carried on and rejects are sent to the final inspector, who destroys all imperfect ones by crushing in the hand. No secondary products are marketed. This rejection of defective mantles is an indication of the high quality of the article sold to the consumer. The majority of defects is due to the unavoidable entering of impurities into the early stages of the process.

A complete paper box factory makes all forms of packing containers, including the printing of labels. The paper tubing is produced from strawboard 0.017 in. thick in 10 to 15 ft. lengths and of all diameters. The company has experimented long to arrive at the proper glue for this tubing and has finally obtained a



CHEMICAL PLANT



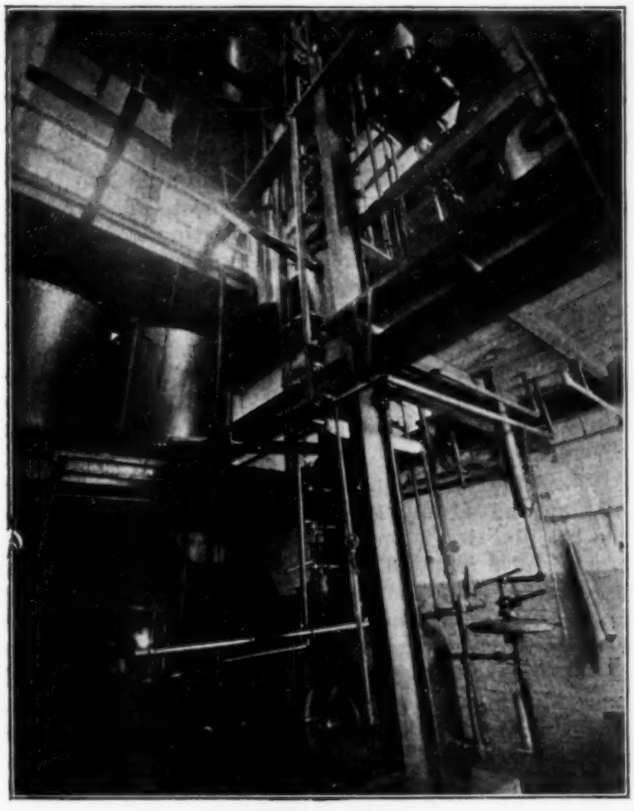
COTTON NITRATING PLANT

satisfactory article in a cold glue, made from potato and tapioca dextrines. (Arabol Co. glue No. 4604c.)

The paper caps for the circular boxes are drawn from circular stamped blanks, the cutting and drawing operation being accomplished on the same punch press. In order to draw these caps successfully it is necessary first to soften the rolls of strawboard by moistening with a mixture of equal parts of tallow and soft soap. This mixture is made in a small tank overhead and applied by passing the strawboard ribbon over a roller which dips in a small vat of the solution, before being fed to the presses.

The rectangular paper boxes are produced on both automatic and hand-fed machines. The smaller sizes are carried to their respective wire mesh bins by air suction, or by belt conveyors to the packing department. Fifty to 60 tons of paper scrap is recovered and baled each week. The printing department is completely equipped with cylinder and platen presses.

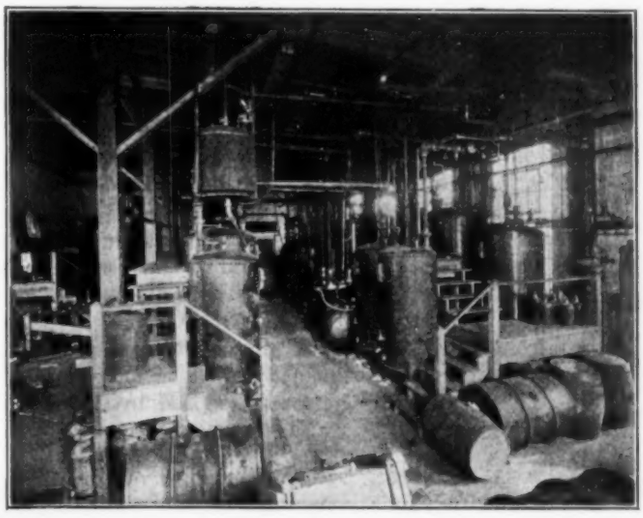
This factory employs the Brightwood box machine, the Inman box machine, the Knowlton stay machine and metal edge machines made by the National Metal Edge Box Co. The Welsbach Co. has also manufactured a number of the automatic box machines in operation.



ALCOHOL STILL

Fixture Manufacture

An extensive fixture factory produces all types of fixtures and fixture parts required by the gas illuminating trade, from the smallest mantle supports to the latest type of indirect lighting bowl. The pattern shop and foundry makes malleable iron, brass, aluminum and composition castings. One section of the machine shops contains automatic screw machines and multiple spindle drill presses; another contains batteries of punch presses, and the third a number of lathes. A complete tool-making department is operated in conjunction with these shops. A sheet metal department manufactures the necessary fixture parts.



COLLODION PLANT

The electroplating department is capable of producing any desired finish on the fixtures and protecting with suitable lacquer. One of the most recent developments in this work consists of a tumbling barrel, equipped with electrodes for plating while the polishing operation is in progress. The wooden barrel revolves with the axis supported at an angle of about 45 deg. One electrode is attached to the revolving mechanism while the other is suspended vertically in the solution through the open end of the barrel. This is shown in the background of the picture.

The fixture assembling rooms occupy a large floor space and it is here that minor machine operations are carried on and the manufactured parts are assembled to produce the completed fixture.

The machine shop employs Brown & Sharpe hand and automatic screw machines, Warner & Swazey hand screw machines, and Avery drill presses. The power punch presses are of three makes, namely, Ferracute, Bliss, and Henderson. Foot presses are made by Waterbury and Farrel companies.

The section of the works which is perhaps of greatest interest to CHEMICAL & METALLURGICAL ENGINEERING readers is that in which collodion is made and where

the rare earths in the form of monazite sands are reduced to secure thorium, cerium, mesothorium and radium compounds.

Collodion, as used to hold the physical structure of the thoria-ceria mantle intact during commercial handling, must have special characteristics to serve this purpose. It must be non-shrinkable when drying, otherwise the oxide structure would be destroyed and the mantle would crumble when collodion is burned off by the ultimate consumer. It is further necessary that collodion be pure and a reliable source of supply be at hand.

The plant produces from 10,000 to 15,000 kilos per month, the entire amount being used in the mantle factory. The cotton is nitrated under cleanest possible conditions, dried in a centrifugal wringer and the process carried to final conclusion in an apparatus of collodion plant, as shown.

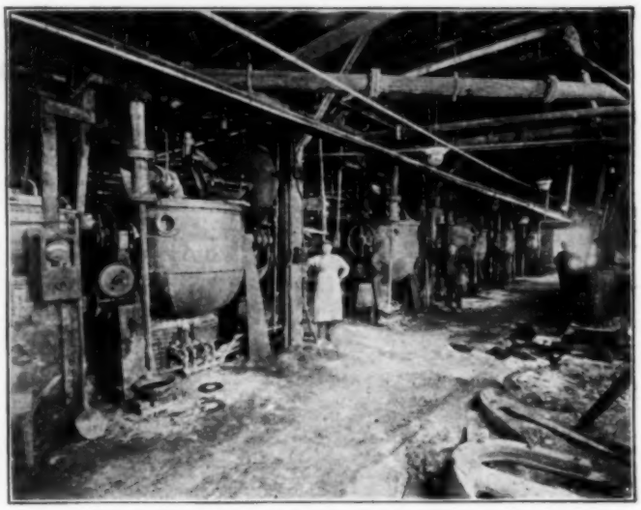
The feature most worthy of note is the method employed in conducting the collodion to the dipping machines. The piping system is made up of double pipe and fittings throughout. The inner pipe carries the collodion, while the annular space between the inner and outer metal is filled with inert gas (CO_2) under higher pressure than that required to force the liquid through the inner pipe. In case of leak in the inner wall the gas will enter the central conductor and force the collodion back to the tanks. While this system is expensive to install, it is considered invaluable as an insurance against accident where explosive or inflammable liquids are transported. It is said to be required by law in Berlin where gasoline is stored in excess of 5 gallons.

An alcohol still is operated in connection with this plant, while ammonia is also distilled in an adjoining room. The product of the latter is used in the fabric washing process.

Rare Earth Reduction

The monazite sands consumed at the present time are purchased in Brazil, where they can be obtained more cheaply than the Welsbach Co. can mine them from its Carolina properties. This is due to the fact that the latter deposits are in widely scattered pockets and economical mining operations therefore do not obtain. The ore, or beach sands, occurring in placer deposits near the coast of Brazil is subjected to wet

PRECIPITATING TANKS



MONAZITE SAND DIGESTORS

concentration over jig tables, where the monazite, being the heavier, is separated out from the gangue or silicas. The concentrate, however, still contains the garnet, and after being dried a further separation is made by electromagnetic means in a manner similar to that employed in the zinc industry.

The final product shipped contains about 90 per cent of the monazite crystals which were present in the crude ore, and is in the form of a rather uniformly grained, fine, yellow sand. A typical analysis of this product shows the following content:

	Per Cent		Per Cent
Phosphoric anhydride	28	Thorium oxide	5
Cerium oxide	30	Yttrium oxide	2
Lanthanum oxide	14	Iron oxide }	5
Neodymium oxide }	16	Calcium oxide }	
Praseodymium oxide }			100

The sand is received at the Welsbach works in 100-lb. bags containing 5 to 6 per cent of thoria, the substance most desired in the separation. Definite quantities are mixed with the proper amount of sulphuric acid, with sp.gr. above 66 deg. Baumé, in the digestors, where the mass is agitated under heat for a period of 6 to 8 hours.

The heat is applied below and retained close to the kettle by a sheet steel jacket as shown. The kettle is cast from a special grade of acid-resisting iron. During the heating period, heavy SO_3 fumes are driven off through the cast pipe as shown on the left of the kettle and are conducted to a 16-tube, 85,000-volt Cottrell precipitator. This latter may be seen outside the chemical plant buildings. Its use is necessary to the protection of the surrounding community from the fumes, and a considerable quantity of acid is also recovered.

When the operation is completed, the heat is shut off, but the agitator is kept running, and the tee in the SO_3 line is disconnected from the kettle. The top cover is also removed for the pouring. The removal of the tee permits the apparatus to be turned on its trunnions, in a manner similar to the operation of a bessemer converter, and the pasty mass, consisting of phosphates and the sulphates which have formed, is dumped into a lead-lined receiving vat. This vat, located on the side opposite that shown in the picture, with its top about 1 in. from the floor level, is filled with water at the time of pouring.

The solution is pumped from these vats, one for

CAUSTICIZING TANKS AND SPERRY FILTER PRESS

each digestor, to the second floor tanks, where it is further diluted. This dilution precipitates the rare earths (about 70 per cent of the sulphates and 3 per cent of the phosphates), which are separated from the liquor in Sperry filter presses on the floor below. The sludge then enters a long series of operations, requiring several weeks, carried on in circular tanks with mechanical agitators. Part of this work involves boiling with caustic to produce hydrates, the object of the whole performance being to remove the residual phosphates. These hydrates are eventually dissolved in hydrochloric acid to form chlorides.

It is about this point that the separation of the thorium and cerium compounds is made, and the large part of the work from here on consists of refining the thorium and such quantity of the cerium as is required. The equipment embraces several batteries of glazed earthenware bowls, made by General Ceramics Co., placed under mechanical stirrers as shown in the picture. Practically all the moving parts of this apparatus were made in the company's shops. A new caustic recovery evaporator made by the F. D. Stokes Machine Co. has just been installed.

When the thorium group is split off from the cerium, about 95 per cent separation of thorium present is recovered. The radium and mesothorium comes down with the thorium. The cerium residue is about 50 per cent pure and is known to the trade as commercial cerium. It is sold to the carbon manufacturers for use in flaming arc lamp carbons. Its presence in minute quantities greatly adds to the incandescent light in both mantles and carbons. It is also purified and used in medicines such as cerium oxalate. The Welsbach Co. prepares these compounds for the market. The cerium nitrate used in the mantle fluid is necessarily refined to a purity equaling that of the thorium nitrate.

The complete process from the time the sand is placed in the digestors until the pure $Th(NO_3)_4$ is extracted consumes a period of from 2 to 3 months. The plant produces 10,000 to 15,000 kilos per month. Quantities are shipped to Great Britain at the market price of about $10 per kilo. This trade was built up when the supply from Germany was cut off at the beginning of the war.

The supply of radium from Colorado ores is limited and practically the entire output is required for medical purposes. The manufacturers of articles like radiolite watches are therefore forced to search elsewhere for the raw luminous material. The Welsbach Co. has successfully undertaken the manufacture of a mixture of radium and mesothorium to supply this need.

An examination of the chemistry of these two substances reveals parallel characteristics and compounds. The principal difference in the two lies in the fact that the activity of mesothorium continues about seven years, while radio-activity is constant over several hundred years.

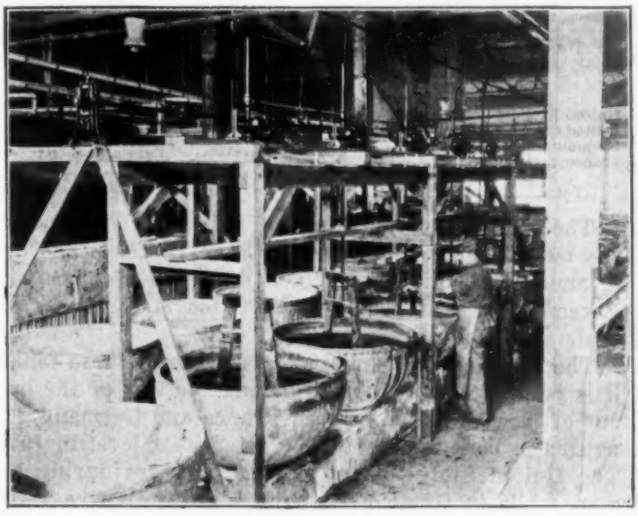
The extraction from the rare earths begins in the thorium plant and a residue of approximately 20 lb. per day is obtained from the thorium purification process. This residue is taken to the radium laboratory, where it is dissolved as a chloride in the so-called zero kettle. From this it is taken through a series of 5 pairs of steam-jacketed kettles, Elyria Enamel Products Co. make, then through a similar set of evaporating dishes. The work consists of a series of precipitations and crystallizations.

The final residue from the chloride solutions is then redissolved as a bromide and the process continues as before, but on the laboratory bench. The solutions pass through about 30 operations in all. For each ton of monazite sand originally treated there is produced one milligram of the rare element mixture.

Other Departments

The company generates power from coal delivered to the bunkers by barge on the Delaware River. Bucket elevators and belts carry to the overhead bins, from which it is automatically weighed to the bank of three Babcock & Wilcox boilers, fired by Riley-Sanford plunger type stokers. Boiler draft is supplied by two Sturtevant fans, direct-driven by steam turbines. The plant is so equipped with measuring and recording devices as to furnish complete data on daily performance. This apparatus includes Hays CO_2 recorders, Venturi boiler feed water meters, and General Electric steam flow meters.

The engine room contains one 400-k.v.a. 2300-volt 3-phase 60-cycle Crocker-Wheeler Co. generator direct-connected to tandem Corliss engines and with belt-driven exciter; one 150-k.v.a. 2300-volt 3-phase 60-cycle General Electric Co. generator direct-connected to vertical type American Ball engine; one 7-panel switchboard equipped with General Electric instruments, ITE



MIXING BOWLS

circuit breaker and switches, including control for operating the two generators in synchronism during peak load periods.

The laboratory and testing department embraces complete research and control chemical laboratories, and physical laboratories equipped with mechanical devices for shock and tensile tests of mantle materials together with apparatus for candle power and life tests on finished mantles.

The plant buildings are of fireproof construction, with Grinnell sprinkler systems. Distilled drinking water is supplied throughout. A complete hospital is equipped for emergency treatment.

The system of conveying materials requires little hand trucking within the works. The storehouse operates Elwell-Parker electric trucks, equipped with Edison storage batteries, for conveying crates within the building. For heavy outside work Pierce-Arrow 2- and 5-ton trucks are employed. The coal loader shown in foreground of "Chemical Plant" picture is made by the Link Belt Co.

The business of making incandescent gas mantles is said to be continually on the increase in this country. Ten per cent of the Welsbach Co.'s output is consumed abroad. The marked growth of the industry is attributed to the fact that an excellent light is secured at a reasonable rate, wherever gas is available. It is probable that the development of the by-product coke oven is giving an impetus to the business.

The writer desires to acknowledge the courtesy of the Welsbach Co. as extended by Dr. H. S. Miner and Mr. C. E. Bliss during preparation of this article.

World Iron and Steel Output

The National Federation of Iron and Steel Manufacturers of Great Britain has issued a memorandum on the world's output of iron and steel, which contains a statistical survey for several years past. Below are given those figures which have not hitherto been published with those of previous years for purposes of comparison. The production of pig iron and steel in the leading countries was as follows:

PIG IRON PRODUCTION

	1918	1917	1916
United Kingdom, gross tons	9,066,000	9,420,000	9,048,000
United States, gross tons	39,052,000	38,621,000	39,435,000
Germany, metric tons	11,590,000	13,142,000	13,285,000
France, metric tons	1,297,000	1,684,000	1,447,000
Total	61,005,000	62,867,000	63,215,000

STEEL PRODUCTION

	1918	1917	1916
United Kingdom, gross tons	9,591,000	9,840,000	9,196,000
United States, gross tons	45,073,000	45,061,000	42,774,000
Germany, metric tons	14,874,000	16,587,000	16,183,000
France, metric tons	1,912,000	2,232,000	1,952,000
Total	71,450,000	73,684,000	70,105,000

The German production for 1918 does not include the output of Luxemberg, the Saar District, and the disannexed Lorraine Province during November and December of that year. The British steel figures include steel castings.

The first and most significant feature of these tables, it is pointed out, is the fall during the war of the output of iron and steel in both France and Germany, the figures in both cases reaching the lowest level in 1918. The United States shows a great increase during the war, while in Great Britain the figures show a fairly constant output of pig iron and an increased output of steel.

In the case of pig iron the production of these four countries in 1900 amounted to 34,000,000 tons, of which Great Britain produced 9,000,000 tons. In 1913 the total output had risen to 66,000,000 tons, of which Great Britain produced 10,000,000 tons, while in 1918 the total had fallen to 61,000,000 tons, of which Great Britain produced 9,000,000 tons.

The production of iron and steel in countries of the second rank in 1916 and 1917 is given as follows:

	Pig Iron		Steel	
	1917	1916	1917	1916
Austria-Hungary	.....	2,418,000	2,921,000	3,330,000
Canada	1,046,000	1,070,000	1,550,000	1,287,000
Italy	475,400	467,000	1,304,000	1,269,000
Russia	.....	3,738,000	.....	.....
Sweden	829,000	733,000	581,000	614,000
Belgium	.....	127,825	.....	95,830

These countries contributed at the outbreak of war about 9,000,000 tons of pig iron and 12,000,000 tons of steel to the world's production. The figures for Italy are significant of the extent to which that country has relied on scrap steel and imported pig iron to obtain steel output.—*Fortnightly Information Review, Aug. 1, 1919.*

How to Relieve "Brass Itch"

The symptoms of brass poisoning and the treatment which should be given are described in the current issue of *Modern Medicine*, Chicago, Illinois, by Dr. R. P. Albaugh, formerly director of the Division of Industrial Hygiene, Ohio State Department of Health.

The symptoms are evident for several hours after exposure to the fumes which are contained in the whitish smoke and sublimation products from molten brass and zinc. The symptoms start with a dry, parched throat, an irritating and unproductive cough, a feeling of constriction in the chest, lassitude, and anorexia, often followed by nausea and vomiting; a headache sometimes develops and chilly sensations are noticeable within one to four hours.

The chills rapidly verge into a distinct rigor which lasts from one and one-half to two or three hours. The application of warm clothing or external heat seems not to diminish the rigor of a chill. Muscular cramps and sharp pains in the joints usually accompany the chill.

The symptoms end rather abruptly, almost by crisis, and are followed at once by a profuse perspiration. The patient will probably fall into a deep sleep following the stage of relaxation and without any apparent ill effects.

Brass poisoning does not occur from handling of the metal or the zinc alloys which go into its composition, but is limited to those exposed to the inhalation of the whitish smoke and sublimation products from the molten metal.

There is no specific treatment for brass poisoning, "brass itch" and "brass chills." Zinc is supposed to be responsible for the bad effects. The affection was formerly confused with malaria.

Some workmen find relief in drinking hot milk to which pepper is added. A good purge also seems beneficial. Dr. Albaugh advises the prevention of brass poisoning by better hygienic arrangements in foundries and smelters, elimination of careless habits of workmen, and large, roomy quarters.

Physical Measurements for Students of Chemistry

Mr. Paul E. Klopsteg of the Leeds & Northrup Co., Philadelphia, presented an appeal in a late number of *Science* for courses in physical measurements for students of chemistry and allied sciences. It appeals to us as sound doctrine, and while the subjects may be included in the curricula of various institutions, we know from experience that an adequate familiarity with them is by far too often lacking among young chemists and Mr. Klopsteg's proposal would seem to cover an important gap.

Although engineering is commonly spoken of as applied physics, the bridge between the pure and applied science in this sense has stretched itself to such amazing lengths that many physicists and many engineers do not attempt to cross it.

Mr. Klopsteg proposes that, in addition to the regular course in general physics, a special course in physical measurements be provided in the senior college year for students who contemplate either graduate work or an immediate entry into industry. He suggests that it occupy at least the equivalent of three 2-hr. periods for one semester of 16 weeks and proposes the following general topics as representing the essential things from which a selection might be made.

(1) The accurate measurement of long and short time intervals.

(2) Measurement of temperatures by methods other than the mercury thermometer. Principles of pyrometry.

(3) Temperature regulation and temperature regulators and controllers.

(4) Principles of precision calorimetry.

(5) The microscope; its theory, and application to the measurement of small lengths.

(6) The reading telescope and its application to the measurement of small angles.

(7) Measurement of refractive index; spectrometer and refractometer.

(8) The spectroscope, and spectroscopic analysis.

(9) Color and colorimetry; intensity of light and photometry.

(10) The polariscope and polarimeter.

(11) The galvanometer; its use as a deflection and as a null instrument.

(12) Ohm's law; measurement of current and potential differences.

(13) Electric power and heating.

(14) Resistance measurement; Wheatstone's bridge, with application to measurement of electrolytic conductivity. The alternating current galvanometer as applied to conductivity measurements.

(15) The potentiometer; application to measurement of thermo-electric forces, electrode potentials, ionic concentrations.

(16) Electrometers and electroscopes; applications to measurements in radioactivity.

(17) Principles of X-ray measurements.

Personal

Dr. F. C. Brown has resigned his position as associate professor of physics, University of Iowa, to accept a position as technical assistant to the director of the Bureau of Standards.

Mr. James L. Bruce has resigned as manager for the Butte & Superior Mining Co. to become general manager for the Davis-Daly Company.

Mr. Alfred Burton, who was engaged with the explosives committee of the Imperial Munition Board, Ottawa, Canada, has accepted a position with the Dominion Dyers, Ltd., London, Ontario.

Mr. Rex Honey, formerly connected with the Dominion Forest Products Laboratory, McGill University, Montreal, has been appointed head of the service department of the Abitibi Power & Paper Co., Ltd., Iroquois Falls, Ontario, in charge of efficiency research and raw materials.

Dr. F. M. G. Johnson, who has been research chemist for the Canadian Consolidated Rubber Co., Ltd., will again be associated with the chemical department at McGill University, Montreal.

Mr. Charles W. McKay has recently become associated with the industrial engineering firm of L. V. Estes, Inc., Chicago, Ill.

Dr. C. Ferdinand Nelson has been elected professor of biological chemistry and head of the department of physiological chemistry which has recently been established at the University of Kansas.

Mr. Arthur Phillips has been appointed assistant professor of metallurgy in the Sheffield Scientific School, Yale University, New Haven, Conn.

Mr. Warren C. Prosser has resigned as superintendent for the Red Mountain Mines Co., to return to professional work in mineral and oil land investigations, with headquarters at Denver.

Dr. J. W. Shipley, professor of chemistry, Manitoba Agricultural College, has resigned to accept an appointment as assistant professor in chemistry, University of Manitoba.

Mr. A. B. Shutts has become general manager for the American Ores and Asbestos Co., Globe, Arizona.

Obituary

Mr. Frank Cochrane, Minister of Lands, Forests and Mines in the Ontario Legislature, died on Sept. 22 at Ottawa.

Mr. Herbert G. Thomson, a graduate of the University of California and general superintendent for the Nevada Packard Mines Co. at Lower Rochester, Nevada, died on Sept. 25 from injuries received in a fall into a shaft while sampling ore.

Mr. Henry B. Underhill, president of the Selby Smelting & Lead Co., died at his residence in San Francisco on Sept. 14.

Current Market Reports

The Non-Ferrous Metal Market

Tuesday, Oct. 14.—There has been no large transactions in the non-ferrous markets during the past week.

Aluminum:—Transactions are largely made on direct contract between producers and consumers. The open market does not show important activity; 98-99 per cent ingots are quoted at 32-33c. lb.; cast scrap, 24½-25c.; sheet scrap, 23-24c.; and clippings, 26½-27¾c.

Antimony:—On 25-ton lots the price is 8½c. and on broken lots 8⅝c. Prices have remained steady in spite of the falling off of the demand by ordnance supply manufacturers. The patent glazed kid leather trade is reported to be using considerable quantities.

Copper:—The close of the war found great supplies of commercial copper alloys such as brass and bronze made up, and

this, in connection with disrupted conditions in Europe, has made the copper market quiet.

Copper, lake	22½ — 24
Copper, electrolytic	22½ — 23½
Copper sheets, hot rolled	33½
Copper sheets, cold-rolled	35
Copper bottoms	41½
Copper rods	25
Copper wire	26
High brass rods & sheets	27¾
High brass rods	26¾
Low brass rods & sheets	30½
Low brass rods	31¼
Brazed brass tubing	39
Brazed bronze tubing	44¾
Seamless copper tubing	37½
Seamless bronze tubing	40
Seamless brass tubing	36
Scrap, heavy mach. comp.	17 — 18
Scrap, heavy and wire	17 — 18
Scrap, light and bottoms	15 — 16
Scrap, heavy, cut and crucible	18½ — 19½
Scrap brass, heavy	10 — 11
Scrap brass, casting	12 — 13
Scrap brass, light	9 — 10
Scrap, No. 1 clean brass turnings	10 — 11
Scrap, No. 1 comp. turnings	15 — 16

Lead:—The price of lead has been advancing and sales are reported as high as 6.3c. The Metal Exchange price is New York spot, 6.15c. and East St. Louis, 6c.

Tin:—The bulk of the present local supply of tin is now tied up in the longshoreman's strike. The market figures are 55 to 56c. lb.

Zinc:—Up to date 3000 tons of zinc have been reported as sold for export. Spot New York quotes 7¾ and East St. Louis 7½c.

OTHER METALS

Bismuth	lb.	$2.95	—	.....
Cadmium	lb.	1.50	—	$1.75
Cobalt	lb.	2.50	—	3.50
Magnesium	lb.	1.75	—	2.10
Mercury	75 lb.	75.00	—	.....
Nickel	lb.	.41	—	.45
Iridium	oz.	175.00	—	.....
Palladium	oz.	115.00	—	120.00
Platinum	oz.	130.00	—	.....
Silver	oz.	1.17¼	—	.....

The Iron and Steel Market

There has been very little activity in the iron and steel markets in the past week, the restricting influence being the strike. The mills that are closed are, of course, in no position to sell, as they have large unfilled obligations as it is, while the mills that are operating are called upon for somewhat heavier deliveries than would be the case were there no strike, since many buyers contract with two or more mills, and if one of the mills is closed by strike the buyer furnishes the other with heavier specifications than would be furnished in normal conditions.

The iron and steel strike is now in its fourth week. While operating gains have been made, they have more strategic than tonnage significance, and taking the steel industry as a whole production is at not over about 60 per cent of capacity, or at a rate a few per cent higher than when the strike was at its strongest point, about the middle of the first week.

The present scope of the strike is: Eastern and western Pennsylvania and the South are running full; the Youngstown district has just started; Chicago and Gary are getting about quarter production out, and Johnstown, Buffalo, Wheeling, Mahoning and Cleveland are closed. The large buyers of steel are making practically no effort to supplement their contracts by open market purchases, as the floating supply is altogether too small to count for anything, but occasional or chance buyers are looking around for steel in stock, when the cost of the steel is of small consequence. Even in normal times steel in stock brings much higher than regular mill prices. At this time the jobbers are very reserved in making sales out of stock, and generally speaking are not even supplying their regular customers fully, as their stock would be wiped out promtply if they sold to all applicants.

There has been a moderate amount of activity in pig iron, chiefly for early deliveries, the buyers being consumers whose regular sources of supply were affected by the strike. Foundry iron is a trifle scarcer than before the strike, but basic iron is a trifle more plentiful.

Prices of pig iron and steel products are unchanged.

The Chemical Market

New York, October 16, 1919.

The epidemic of strikes, particularly the steel strike in this country and the strike of transportation workers in England, has imparted its influence to the local chemical market in the form of a shortage in several products, with a resultant higher price. It is further having a tendency to cool interest in contracts. When contracts are offered it is with a protective clause necessitated by the uncertainty regarding future production costs. Demands for heavy chemicals, however, is of such proportions that large quantities are passing into consumption, but the buying is confined in its scope to nearby requirements. Interest in naval stores and vegetable oils is begining to revive again, but the same is not true of waxes and crude rubber.

Heavy Chemicals

The recent British strike with the unfavorable exchange has worked against export trade and now with all shipping tied up by the present harbor strike, interest centers on domestic commerce. Touching on the export phase, it is of interest that South America continues to place fair sized orders, while last week 1,000 tons of *ammonium sulphate* were shipped to Spain. During the same period several export inquiries for *caustic soda* developed, one calling for delivery of 100 tons over the balance of the year.

An increase in price on *sodium nitrite, sodium prussiate yellow, formaldehyde, denatured alcohol, gum camphor, fluorspar* products, and a cut in figures on *sodium bichromate, tartaric acid,* and *cobalt oxide* are the salient developments since the last review.

Sodium nitrite has had a sensational rise, present quotations varying from 15-18c. per lb., in comparison with the recent level of 9¾-10c. Both domestic and English makers are said to be sold up for the balance of the year. Since England has been unable to ship any *sodium prussiate,* the shortage has become exceedingly acute and prediction has it that it will continue to the end of the year. Speculation has played an active part in the jump to 27c per lb.

The reasons offered for the new price of 24c. per lb. for *formaldehyde* set by manufacturers are scarcity, resulting from very heavy buying by France and England, and the increased price of the raw material, wood alcohol. The augmented value of the latter product accounts for the increase of 4c. per gal. on both 188 and 190 proof *denatured alcohol,* the former thus selling at 56-60c. per gal., the latter at 52-56c., according to quantity. *Gum camphor* continues to meet with unabated demand and prices are strong at $3.50-$3.75. Further competition has lowered *sodium bichromate* to 12-12¾c. per lb. while the new price of *tartaric acid* in the face of slack demand is 74-74½c. per lb. The decline of 10c. per lb. to $1.50-$1.55, on the part of *cobalt oxide* is due to the domestic article being on the market instead of the Canadian.

Directly affected by the steel strike are *aqua ammonia* and *hydrofluoric acid.* With many coke ovens not operating, the production of ammonia and other by-products has decreased. At the same time there has been an unusual call for aqua ammonia. In view of these conditions some apprehension is felt about the supply of other ammonia products, in particular sal ammoniac. Aqua ammonia is firmly held at 8c. per lb. Steel manufacturers have been using little of flux grade of *fluorspar,* which circumstance has increased production costs of the acid grade. This increase is expressed in an advance of all fluorspar products. The new price named for *hydrofluoric acid* is 12-14c. per lb., with 15c. per lb. for *sodium fluoride,* in comparison with 10-11c and 13-14c., respectively. *Sulphuric acid,* even in moderate sized quantities, is not to be obtained. Quotations, therefore, are practically nominal. During the war quantities were produced, but upon the signing of the armistice many producers, reasoning that there would be a surplus, ceased its manufacture. At present, one of the leading producers by running his plant to capacity is scarcely able to fill contracts.

Coal-Tar Products

Neither unsettled labor conditions nor any other contingency seems able to dampen the demand for coal tar products. While all of these products are becoming scarce, spot aniline oil and aniline salts are unobtainable at the respective prices of 32-33c and 33-36c per lb.

General Chemicals

WHOLESALE PRICES IN NEW YORK MARKET, OCT. 15, 1919

		Carlots	Less Carlots
Acetic anhydride	lb.	.....	$0.55 -$0.60
Acetone	lb.	$0.13½–$0.14	.15 – .15½
Acid, acetic, 28 per cent.	cwt.	2.50 – 3.00	3.00 – 3.25
Acetic, 56 per cent.	cwt.	5.00 – 5.50	6.00 – 6.50
Acetic, glacial, 99½ per cent, carboys	cwt.	12.00 –12.50	12.90 –13.50
Boric, crystals	lb.	.13 – .13½	.13½– .14
Boric, powder	lb.	.13 – .13½	.13½– .14
Hydrochloric, (muriatic) tech. 20 deg.	cwt.	1.50 – 1.75	2.00 – 2.50
Hydrofluoric, 52 deg.	lb.	.12 –	.14 – .....
Lactic, 44 per cent. tech	lb.	.11 – .14	.12 – .16
Lactic, 22 per cent. tech	lb.	.05 – .06	.05½– .07
Molybdic, C. P.	lb.	..... –	4.00 – 4.25
Nitric, 40 deg.	lb.	.06 – .06½	.07 – .08½
Nitric, 42 deg.	lb.	.07 – .07½	.08 – .....
Oxalic, crystals	lb.	.23 – .25	.25 – .30
Phosphoric, Ortho, 50 per cent. solution	lb.	.09 –	.10 – .14
Picric	lb.	.30 – .35	.40 – .50
Pyrogallic, resublimed	lb.	..... –	2.30 – 2.60
Sulphuric, 60 deg., tank cars	ton	12.00 –16.00	..... – .....
Sulphuric, 60 deg., drums	ton	17.00 –	22.00 – .....
Sulphuric, 60 deg., carboys	ton	20.00 –	25.00 – .....
Sulphuric, 66 deg., tank cars	ton	17.00 –18.00	22.00 –23.00
Sulphuric, 66 deg., drums	ton	20.00 –21.00	25.00 –26.00
Sulphuric, 66 deg., carboys	ton	25.00 –	30.00 –40.00
Sulphuric, fuming, 20 per cent. (oleum) tank cars	ton	20.00 –	27.00 – .....
Sulphuric, fuming, 20 per cent. (oleum) drums	ton	25.00 –	32.00 – .....
Sulphuric, fuming, 20 per cent. (oleum) carboys	ton	30.00 –	35.00 – .....
Tannic, U. S. P.	lb.	..... –	1.35 – 1.45
Tannic (tech.)	lb.	..... –	.42 – .55
Tartaric, crystals	lb.	..... –	.74 – .77
Tungstic, per lb. of WO	lb.	..... –	1.20 – 1.40
Alcohol, Ethyl	gal.	4.80 –	4.95 – .....
Alcohol, Methyl	gal.	1.30 –	1.33 – 1.38
Alcohol, denatured, 188 proof	gal.	.56 –	.58 – .60
Alcohol, denatured, 190 proof	gal.	.52 –	.54 – .56
Alum, ammonia lump	lb.	.03½– .04½	.04½– .04½
Alum, potash lump	lb.	.08 – .08½	.09 – .09½
Alum, chrome lump	lb.	.15 – .16	.18 – .20
Aluminum sulphate, commercial	lb.	.01½– .02	.02½– .02½
Aluminum sulphate, iron free	lb.	.02½– .03	.03½– .03½
Aqua ammonia, 26 deg., drums (750 lb.)	lb.	.08 –	.08½– .08½
Ammonia, anhydrous, cylinders (100-150 lb.)	lb.	..... –	.30 – .35
Ammonium carbonate, powder	lb.	.13 – .13½	.14 – .14½
Ammonium chloride, granular (white salammoniac)	lb.	.12½– .13	.13½– .14
Ammonium chloride, granular (gray salammoniac)	lb.	.12 – .12½	.13 – .13½
Ammonium nitrate	lb.	.10 –	.11 – .12
Ammonium sulphate	lb.	.05 –	.06 – .....
Amyl acetate	gal.	..... –	3.75 – 4.00
Arsenic, oxide, lumps (white arsenic)	lb.	..... –	.09 – .09½
Arsenic, sulphide, powdered (red arsenic)	lb.	..... –	..... – .....
Barium chloride	ton	85.00 –	90.00 –100.00
Barium dioxide (peroxide)	lb.	.22 –	.24 – .....
Barium nitrate	lb.	.10 – .10½	.11 – .12
Barium sulphate (precip.) (blanc fixe)	lb.	.03 – .03½	.03½– .04
Bleaching powder (see calcium hypochlorite)		..... –	..... – .....
Blue Vitriol (see copper sulphate)		..... –	..... – .....
Borax (see sodium borate)		..... –	..... – .....
Brimstone (see sulphur, roll)		..... –	..... – .....
Bromine	lb.	..... –	.65 – .75
Calcium acetate	cwt.	2.00 – 2.05	2.10 – .....
Calcium carbide	lb.	..... –	.04 – .05
Calcium chloride, fused, lump	ton	19.00 –25.00	30.00 –40.00
Calcium chloride, granulated	lb.	.01½– .01½	.02 – .02½
Calcium hypochlorite (bleaching powder)	cwt.	2.25 – 2.50	..... – 2.75
Calcium peroxide	lb.	..... –	1.50 – 1.70
Calcium phosphate, monobasic	lb.	..... –	.75 – .....
Calcium sulphate, precipitated	lb.	..... –	.09 – .09½
Carbon bisulphide	lb.	.05½–	.06 – .....
Carbon tetrachloride, drums	lb.	.10 – .11	.12 – .14
Carbonyl chloride (phosgene)	lb.	..... –	.75 – .....
Caustic potash (see potassium hydroxide)		..... –	..... – .....
Caustic soda (see sodium hydroxide)		..... –	..... – .....
Chlorine, gas, liquid-cylinders (100 lb.)	lb.	.05 – .05½	.08 – .....
Cobalt oxide	lb.	..... –	1.50 – 1.55
Copperas (see iron sulphate)		..... –	..... – .....
Copper carbonate, green precipitate	lb.	..... –	.28 – .31
Copper cyanide	lb.	..... –	.65 – .70
Copper sulphate, crystals	lb.	.08½– .08½	.09 – .09½
Cream of tartar (see potassium bitartrate)		..... –	..... – .....
Epsom salt (see magnesium sulphate)		..... –	..... – .....
Formaldehyde, 40 per cent.	lb.	..... –	.22½– .24
Glauber's salt (see sodium sulphate)		..... –	..... – .....
Glycerine	lb.	..... –	.19 – .21
Iodine, resublimed	lb.	..... –	4.50 – .....
Iron oxide, red	lb.	..... –	.03 – .20
Iron sulphate, (copperas)	cwt.	1.00 –	1.20 – 1.50
Lead acetate, normal	lb.	..... –	.12½– .14½
Lead arsenate (paste)	lb.	..... –	.13 – .17
Lead nitrate, crystals	lb.	..... –	.85 – .86½
Litharge	lb.	..... –	.09½– .10½
Lithium Carbonate	lb.	..... –	1.50 – .....
Magnesium carbonate, technical	lb.	..... –	.13 – .14½
Magnesium sulphate, U. S. P.	100 lb.	2.00 – 2.63	2.75 – 3.00
Magnesium sulphate, commercial	100 lb.	1.75 –	2.00 – 2.50
Nickel salt, double	lb.	.14 –	.15 – .....
Nickel salt, single	lb.	.12 –	.15 – .16
Phosgene (see carbonyl chloride)		..... –	..... – .....
Phosphorus, red	lb.	..... –	.60 – .70
Phosphorus, yellow	lb.	..... –	.35 – .37
Potassium bichromate	lb.	.28 – .30	..... – .....
Potassium bitartrate (cream of Tartar)	lb.	..... –	.55 – .60
Potassium bromide, granular	lb.	..... –	..... – .60
Potassium carbonate, U. S. P.	lb.	.60 –	.65 – .70
Potassium carbonate, crude	lb.	.19 –	.21 – .....
Potassium chlorate, crystals	lb.	.20 – .24	.25 – .30
Potassium cyanide, 98-99 per cent.	lb.	nominal	
Potassium hydroxide (caustic potash)	lb.	.30 – .32	.35 – .40
Potassium iodide	lb.	..... –	3.55 – 3.60
Potassium nitrate	lb.	.19 –	.21 – .....
Potassium permanganate	lb.	..... –	.55 – .65
Potassium prussiate, red	lb.	..... –	1.05 – 1.15
Potassium prussiate, yellow	lb.	..... –	.45 – .55
Potassium sulphate	ton	225.00 –	..... – .....
Rochelle salts (see sodium potas. tartrate)		..... –	..... – .....
Salammoniac (see ammonium chloride)		..... –	..... – .....
Sal soda (see sodium carbonate)		..... –	..... – .....
Salt cake (sodium sulphate)	ton	17.00 –21.00	..... – .....
Silver cyanide	oz.	..... –	1.19 – .....
Silver nitrate	oz.	..... –	.69½– .70½
Soda ash, light	100 lb.	1.90 –	2.00 – .....
Soda ash, dense	100 lb.	2.25 –	2.50 – 2.75
Sodium acetate	lb.	.05½– .06½	.07 – .08
Sodium bicarbonate	100 lb.	2.35 –	2.75 – 3.00
Sodium bichromate	lb.	.12 – .12½	.12½– .13
Sodium bisulphate (nitre cake)	ton	3.00 – 8.00	10.00 – .....
Sodium bisulphite	cwt.	1.80 – 1.90	2.00 – 2.10
Sodium borate (borax)	lb.	.07½–	.08 – .08½
Sodium carbonate (sal soda)	100 lb.	1.35 – 1.50	1.50 – 1.75
Sodium chlorate	lb.	.15 –	.16 – .18½
Sodium cyanide	lb.	.30 –	.31 – .34
Sodium fluoride	lb.	.14 –	.15 – .16
Sodium hydroxide (caustic soda)	100 lb.	3.30 –3.40	3.45 – 3.50
Sodium molybdate	lb.	2.50 –	3.25 – .....
Sodium nitrate	100 lb.	3.00 – 3.25	3.75 – 4.00
Sodium nitrite	lb.	.15 – .17	..... – .18
Sodium peroxide, powdered	lb.	..... –	.30 – .32
Sodium phosphate, dibasic	lb.	.03½– .04	.04½– .05
Sodium potassium tartrate (Rochelle salts)	lb.	..... –	.43 – .45½
Sodium prussiate, yellow	lb.	.27 –	.27½– .28
Sodium silicate, solution (40 deg.)	lb.	.01½– .02	.02 – .02½
Sodium silicate, solution (60 deg.)	lb.	.02½– .03	.03½– .04½
Sodium sulphate, crystals (Glauber's salts)	cwt.	1.15 – 1.25	1.50 – 2.00
Sodium sulphide, crystal, 60-62 per cent. (conc)	lb.	..... –	.05 – .06
Sodium sulphite, crystals	lb.	.03½–	.04 – .06
Strontium nitrate, crystals	lb.	.25 –	.28 – .....
Sulphur chloride	lb.	.05½–	.06 – .....
Sulphur, crude	ton	22.00 –	..... – .....
Sulphur dioxide, liquid, cylinders	lb.	..... –	.10 – .12
Sulphur (sublimed), flour	100 lb.	3.10 –	3.40 – 3.65
Sulphur, roll (brimstone)	100 lb.	2.95 –	3.15 – 3.40
Tin bichloride (stannous)	lb.	.44 –	.46 – .50
Tin oxide	lb.	..... –	.60 – .....
Zinc carbonate, precipitate	lb.	..... –	.20 – .....
Zinc chloride, gran.	lb.	.12½–	.13½– .14
Zinc cyanide	lb.	.49 –	.50 – .....
Zinc dust	lb.	.09 – .11	.11 – .14
Zinc oxide, dry American	lb.	..... –	.09½– .09½
Zinc sulphate	lb.	.03½– .03½	.04 – .04½

Coal-Tar Products

NOTE—The following prices are for original packages in large quantities:

Alpha naphthol, crude	lb.	$1.00 —	$1.10
Alpha naphthol, refined	lb.	1.40 —	1.50
Alpha naphthylamine	lb.	.32 —	.50
Aniline oil, drums extra	lb.	.32 —	.33
Aniline salts	lb.	.33 —	.36
Anthracine, 80% in drums (100 lb.)	lb.	.90 —	1.00
Benzaldehyde (f.f.c.)	lb.	1.00 —	1.15
Benzidine, base	lb.	1.00 —	1.25
Benzidine, sulphate	lb.	.90 —	1.15
Benzoic acid, U. S. P.	lb.	.90 —	1.10
Benzoate of soda, U. S. P.	lb.	.85 —	1.10
Benzol, pure, water-white, in drums (100 lb.)	gal.	.32 —	.....
Benzol, 90%, in drums (100 lb.)	gal.	.24 —	.28
Benzyl chloride, 95-97%, refined	lb.	.35 —	.40
Benzyl chloride, tech.	lb.	.23 —	.35
Beta naphthol benzoate	lb.	3.75 —	4.50
Beta naphthol, sublimed	lb.	.75 —	.80
Beta naphthol, tech.	lb.	.45 —	.55
Beta naphthylamine, sublimed	lb.	2.25 —	2.35
Cresol, U. S. P., in drums (100 lb.)	lb.	.18 —	.....
Ortho-cresol, in drums (100 lb.)	lb.	.23 —	.25
Cresylic acid, 97-99%, straw color, in drums	gal.	.85 —	.90
Cresylic acid, 95-97%, dark, in drums	gal.	.80 —	.85
Cresylic acid, 50%, first quality, drums	gal.	.60 —	.....
Dichlorbenzol	lb.	.07 —	.10
Diethylaniline	lb.	1.40 —	2.25
Dimethylaniline	lb.	.55 —	.60
Dinitrobenzol	lb.	.26 —	.37
Dinitroclorbenzol	lb.	.25 —	.30
Dinitronaphthaline	lb.	.45 —	.55
Dinitrophenol	lb.	.33 —	.36
Dinitrotoluol	lb.	.38 —	.45
Dip oil, 25%, tar acids, car lots, in drums	gal.	.38 —	.65
Diphenylamine	lb.	.58 —	.75
H-acid	lb.	1.60 —	1.75
Metaphenylenediamine	lb.	1.15 —	1.80
Monochlorbenzol	lb.	.12 —	.15
Monoethylaniline	lb.	1.50 —	1.75
Naphthaline crushed, in bbls. (250 lb.)	lb.	.06 —	.08
Naphthaline, flake	lb.	.06½ —	.07½
Naphthaline, balls	lb.	.08½ —	.10
Naphthionic acid, crude	lb.	.75 —	1.25
Nitrobenzol	lb.	.14 —	.19
Nitro-naphthaline	lb.	.35 —	.45
Nitro-toluol	lb.	.27 —	.20
Ortho-amidophenol	lb.	3.00 —	4.25
Ortho-dichlor-benzol	lb.	.15 —	.20
Ortho-nitro-phenol	lb.	.90 —	1.25
Ortho-nitro-toluol	lb.	.25 —	.40
Ortho-toluidine	lb.	.25 —	.45
Para-amidophenol, base	lb.	2.50 —	3.50
Para-amidophenol, HCl	lb.	2.50 —	3.25
Para-dichlor-benzol	lb.	.15 —	.18
Paranitraniline	lb.	.95 —	1.10
Para-nitro-toluol	lb.	1.35 —	1.50
Paraphenylenediamine	lb.	2.50 —	4.00
Paratoluidine	lb.	1.50 —	2.50
Phthalic anhydride	lb.	1.50 —	2.15
Phenol, U. S. P., drums (dest.), (240 lb.)	lb.	.16 —	.17
Pyridin	gal.	2.50 —	.....
Resorcin, technical	lb.	3.50 —	3.75
Resorcin, pure	lb.	6.50 —	6.75
Salicylic acid, tech., in bbls. (110 lb.)	lb.	.37 —	.45
Salicylic acid, U. S. P.	lb.	.45 —	.50
Salol	lb.	.90 —	.95
Solvent naphtha, water-white, in drums, 100 gal.	gal.	.20 —	.27
Solvent naphtha, crude, heavy, in drums, 100 gal.	gal.	.18 —	.24
Sulphanilic acid, crude	lb.	25 —	30

Tolidine	lb.	$1.70	—	$2.50
Toluidine, mixed	lb.	.45	—	.55
Toluol, in tank cars	gal.	.26	—	.....
Toluol, in drums	gal.	.27	—	.30
Xylidine, drums, 100 gal.	lb.	.44	—	.50
Xylol, pure, in drums	gal.	.37	—	.45
Xylol, pure, in tank cars	gal.	.35	—	.....
Xylol, commercial, in drums, 100 gal.	gal.	.23	—	.27
Xylol, commercial, in tank cars	gal.	.22	—	.....

Waxes

Prices based on original packages in large quantities.

Beeswax, natural crude, yellow	lb.	$0.42	—	$0.44
Beeswax, refined, yellow	lb.	.46	—	.88
Beeswax, white pure	lb.	.64	—	.66
Carnauba, No. 1	lb.	.85	—	.88
Carnauba, No. 2, regular	lb.	.67	—	.80
Carnauba, No. 3, North Country	lb.	.48	—	.50
Japan	lb.	.18	—	.20
Paraffine waxes, crude match wax (white) 105-110 m.p.	lb.	.06	—	...
Paraffine waxes, crude, scale 124-126 m.p.	lb.	.06	—	...
Paraffine waxes, refined, 118-120 m.p.	lb.	.07	—	.08
Paraffine waxes, refined, 128-130 m.p.	lb.	.09	—	...
Paraffine waxes, refined, 133-135 m.p.	lb.	.10½	—	.11½
Paraffine waxes, refined, 135-137 m.p.	lb.	.12	—	.13½
Stearic acid, single pressed	lb.	.26	—	.28
Stearic acid, double pressed	lb.	.27	—	.29
Stearic acid, triple pressed	lb.	.31	—	.33

Flotation Oils

All prices are f.o.b. New York, unless otherwise stated, and are based on carload lots. The oils in 50-gal. bbls., gross weight, 500 lb.

Pine oil, steam dist., sp. gr., 0.930-0.940	gal.	$1.10		
Pine oil, pure, dest. dist.	gal.	.96		
Pine tar oil, ref., sp. gr. 1.025-1.035	gal.	.45		
Pine tar oil, crude, sp. gr. 1.025-1.035 tank cars f.o.b. Jacksonville, Fla.	gal.	.34		
Pine tar oil, double ref., sp. gr. 0.965-0.990	gal.	.65		
Pine tar, ref., thin, sp. gr., 1.080-1.960	gal.	.38		
Turpentine, crude, sp. gr., 0.900-0.970	gal.	.85		
Hardwood oil, f.o.b. Mich., sp. gr., 0.960-0.990	gal.	.30		
Pinewood creosote, ref.	gal.	.48		

Naval Stores

The following prices are f.o.b., New York, for carload lots.

Rosin B-D, bbl.	280 lb.	$16.25	—	$17.50
Rosin E-I	280 lb.	17.00	—	19.25
Rosin K-N	280 lb.	20.50	—	23.00
Rosin W. G.-W. W.	280 lb.	24.00	—	24.25
Wood rosin, bbl.	280 lb.	16.00	—	17.00
Spirits of turpentine	gal.	1.70	—	....
Wood turpentine, steam dist.	gal.	1.50	—	
Wood turpentine, dest. dist.	gal.	1.48	—	
Pine tar pitch, bbl.	200 lb.	8.25	—	8.50
Tar, kiln burned, bbl. (500 lb.)	bbl.	13.50	—	14.25
Retort tar, bbl.	280 lb.	14.50	—	14.90
Rosin oil, first run	gal.	.86	—	.91
Rosin oil, second run	gal.	.88	—	.93
Rosin oil, third run	gal.	.95	—	1.07
Rosin oil, fourth run	gal.	1.05	—	1.10

Solvents

73-76 deg., steel bbls. (85 lb.)	gal.	$0.33½		
70-72 deg., steel bbls. (85 lb.)	gal.	.31½		
68-70 deg., steel bbls. (85 lb.)	gal.	.30½		
V. M. and P. naphtha, steel bbls. (85 lb.)	gal.	.23½		

Crude Rubber

Para—Upriver fine	lb.	$0.52	—	$0.52½
Upriver coarse	lb.	.31	—	.32½
Upriver caucho ball	lb.	.32	—	.32½
Plantation—First latex crepe	lb.	.49½	—	.50
Ribbed smoked sheets	lb.	.48½	—	.49
Brown crepe, thin, clean	lb.	.43½	—	.44
Amber crepe No. 1	lb.	.47	—	.48

Oils

VEGETABLE

Unless otherwise noted, the following prices are f.o.b., New York.

Castor oil, No. 3, in bbls.	lb.	$0.18	—	$0.19
Castor oil, AA, in bbls.	lb.	.21	—	.22
China wood oil, in bbls.	lb.	.22	—	.23
Cocoanut oil, Ceylon grade, in bbls.	lb.	.17½	—	.18
Cocoanut oil, Cochin grade, in bbls.	lb.	.19	—	.20
Corn oil, crude, in bbls.	lb.	.17	—	.23
Cottonseed oil, crude (f.o.b. mill)	lb.	.17½	—	.19
Cottonseed oil, summer yellow	lb.	.22	—	.24
Cottonseed oil, winter yellow	lb.	.22	—	.25
Linseed oil, raw, car lots	gal.	1.64	—	1.75
Linseed oil, raw, tank cars	gal.	1.65	—	1.70
Linseed oil, boiled, car lots	gal.	1.70	—	1.75
Olive oil, commercial	gal.	2.40	—	2.50
Palm, Lagos	lb.	.17	—	.17½
Palm, bright red	lb.	.16½	—	.17½
Palm, Niger	lb.	.16	—	.17
Peanut oil, crude, tank cars (f.o.b. mill)	lb.	.20	—	.21
Peanut oil, refined, in bbls.	lb.	.23	—	.25
Rapeseed oil, refined in bbls.	gal.	1.50	—	1.60
Rapeseed oil, blown, in bbls.	gal.	1.57	—	1.70
Soya bean oil (Manchurian), in bbls., N. Y.	lb.	.17½	—	.18
Soya bean oil, tank cars, f.o.b., Pacific coast	lb.	.14½	—	.15

FISH

Winter pressed Menhaden	gal.	$1.28	—	.....
Yellow bleached Menhaden	gal.	1.30	—	$1.31
White bleached Menhaden	gal.	1.32	—	.....
Blown Menhaden	gal.	1.34	—	1.38

Miscellaneous Materials

All Prices f.o.b., N. Y.

Barytes, domestic, white, floated	ton	$25.00	—	$36.00
Barytes, off color	ton	20.00	—	25.00
Blanc fixe, dry	lb.	.03½	—	.04½
Blanc fixe, pulp	ton	35.00	—	47.50
Casein	lb.	.16	—	.18
Chalk, English, extra light	lb.	.05	—	.07
Chalk, English, light	lb.	.04½	—	.06
Chalk, English, dense	lb.	$ .04	—	$ .05
China clay (Kaolin), imported, lump	ton	25.00	—	35.00
China clay (Kaolin), imported, powdered	ton	30.00	—	60.00
China clay (Kaolin), domestic, lump	ton	10.00	—	20.00
China clay (Kaolin), domestic, powdered	ton	25.00	—	40.00
Feldspar	ton	12.00	—	16.00
Fluorspar, acid grade, lump, f.o.b. mines	net ton	30.00	—	$35.00
Fluorspar, acid grade, ground, f.o.b. mines	net ton	35.00	—	45.00
Fuller's earth, domestic, powdered	ton	30.00	—	40.00
Fuller's earth, imported, powdered	ton	....	—	....
Pumice stone, imported	lb.	.03	—	.06
Pumice stone, domestic	lb.	.02½	—	.....
Shellac, TN	lb.	1.00	—	....
Shellac, D. C.	lb.	.....	—	....
Shellac, V. S. O.	lb.	.....	—	....
Shellac, Diamond I.	lb.	.....	—	....
Shellac, orange, fine	lb.	1.05	—	....
Shellac, orange, superfine	lb.	1.10	—	1.30
Shellac, A.C. garnet	lb.	1.00	—	.....
Shellac, bleached, bone dry	lb.	1.25	—	.....
Shellac, bleached, fresh ground	lb.	1.20	—	.....
Soapstone	ton	15.00	—	25.00
Talc, domestic	ton	16.00	—	60.00
Talc, imported	ton	55.00	—	60.00

Refractories

Following prices are f.o.b. works:

Chrome brick	net ton	80-90 at Chester, Penn.
Chrome cement	net ton	45-50 at Chester, Penn.
Clay brick, 1st quality fireclay	net ton	35-45 at Clearfield, Penn.
Clay brick, 2nd quality	net ton	30-35 at Clearfield, Penn.
Magnesite, dead burned	net ton	50-55 at Chester, Penn.
Magnesite brick, 9 x 4½ x 2½ in.	net ton	80-90 at Chester, Penn.
Silica brick	net ton	41-45 at Mt. Union, Penn.

Ferro-alloys

All prices f.o.b. works.

Ferro-carbon-titanium, 15-18%, f.o.b. Niagara Falls, N. Y.	net ton	$200.00	—	$250.00
Ferro-chrome, per lb. of Cr. contained, 6-8% carbon	lb.	.25	—	.40
Ferro-chrome, per lb. of Cr. contained, 2-4% carbon	lb.	.70	—	.....
Ferro-manganese, 70-80% Mn	gross ton	105.00	—	115.00
Spiegeleisen, 16-20% Mn	gross ton	35.00	—	36.00
Ferro-molybdenum, per lb. of Mo	lb.	2.50	—	3.00
Ferro-silicon, 50%	gross ton	85.00	—	95.00
Ferro-silicon, 75%	gross ton	150.00	—	175.00
Ferro-silicon, 10-15%	gross ton	45.00	—	60.00
Ferro-tungsten, 70-80%, per lb. of contained W.	lb.	1.25	—	1.40
Ferro-uranium, 35-50%, of U	lb.	7.00	—	.....
Ferro-vanadium, 30-40% per lb. of contained V.	lb.	5.50	—	7.00

Ores and Semi-finished Products

Chrome ore, 35-40%, Cr_2O_3	unit	$0.60	—	$0.80
Chrome ore, 48% and over	unit	.90	—	1.00
Coke, foundry, f.o.b. ovens	net ton	5.50	—	6.00
Coke, furnace, f.o.b. ovens	net ton	4.00	—	5.00
Petroleum coke, refinery, Atlantic seaboard	net ton	12.00	—	12.50
Fluorspar, gravel, f.o.b. mines	net ton	20.00	—	25.00
Manganese ore, 45% Mn and over	unit	.50	—	.75
Manganese ore, chemical (MnO_2)	gross ton	60.00	—	70.00
Molybdenite, 85% MoS_2, per lb. of MoS_2	lb.	.75	—	.85
Tungsten, Scheelite, 60% WO_3 and over, per unit of WO_3	unit	9.00	—	15.00
Tungsten, Wolframite, 60% WO_3 and over, per unit of WO_3	unit	7.50	—	10.00
Uranium oxide, 96%	lb.	.....	—	.....
Vanadium pentoxide, 99%	lb.	6.00	—	.....
Pyrites, foreign, lump	unit	.13	—	.....
Pyrites, foreign, fine	unit	.13	—	.....
Pyrites, domestic, fine	unit	.14	—	.17½
Ilmenite, 52% TiO_2, f.o.b. N. Y.	net ton	40.00	—	.....
Rutile, 95% TiO_2, f.o.b. N. Y.	net ton	200.00	—	.....
Carnotite, minimum 2% U_3O_8, per lb. of U_3O_8	lb.	2.75	—	3.00
Zircon, washed, iron free, f.o.b. N. Y.	net ton	135.00	—	.....
Monazite, per unit of ThO_2, f.o.b. N. Y.	unit	42.00	—	.....

Plant Materials and Supplies

In carload lots, New York, unless otherwise stated.

BUILDING MATERIALS

Portland cement, at dock, without bags	bbl.	$2.30
Lump lime, common, including container	300 bbl.	2.65
Common brick, at dock	M.	15.00
Yellow pine, 3x4 to 8x8, 20 ft. and under	M.	48.00
Yellow pine, 3x4 to 8x8, 20 ft. and under at Chicago	M.	55.00
Yellow pine, 3x4 to 8x8, 20 ft. and under at St. Louis	M.	43.00
Roofings, tar felt (14 lb. per 100 sq.ft.)	ton	60.00–70.00
Roofings, tar pitch (in 400-lb. bbl.) carlots	ton	21.00
Roofings, asphalt pitch carlots	ton	34.00
Roofings, asphalt felt carlots	ton	63.00
Roofings, slate-surfaced, per roll of 108 sq.ft. carlots		2.25
Roofings, slate-finished shingles, 100 sq.ft. carlots		6.00
Linseed oil, raw in barrels	gal.	2.15
Linseed oil, 5 gal. cans	gal.	2.30
Red lead, dry, 100 lb. keg	lb.	.13
Red lead, in oil, 100 lb. keg	lb.	.14½
Red lead, dry, 5 lb. cans	lb.	.15
Red lead, in oil, 5 lb. cans	lb.	.16½
White lead, dry and in oil, 100 lb. keg	lb.	.13
White lead, dry and in oil, 25 and 50 lb. kegs	lb.	.13½
White lead, dry and in oil, 5 lb. cans	lb.	.15

STRUCTURAL STEEL, MILL, PITTSBURGH

Beams and channels, 3 to 15-in.	100 lb.	$2.45
Angles, 3 to 6-in., ¼-in. thick	100 lb.	2.45
Tees, 3-in. and larger	100 lb.	2.45
Plates	100 lb.	2.66
Rivets, structural, ⅝-in. and larger	100 lb.	4.20
Rivets, conehead for boilers, ½-in. and larger	100 lb.	4.30
Sheets, No. 28 black	100 lb.	4.35
Sheets, No. 10 blue annealed	100 lb.	3.55
Sheets, No. 28 galvanized	100 lb.	5.70

For painted corrugated sheets, add 30c. per 100 lb. for 25 to 28 gage; 25c. fo 19 to 24 gage; for galvanized corrugated sheets, add 15c., all gages.

INDUSTRIAL

Financial, Construction and Manufacturers' News

CONSTRUCTION AND OPERATION

NOTE: These items were compiled as of Nov. 5, but appear in this issue due to the delay in publication caused by the printers' strike.

Arizona

DOUGLAS—The North Tigre Mining Co. is in the market for new machinery for a 100-ton concentration mill. Frank J. Holmes, Superintendent.

CLIFTON—E. R. Shortridge, town clerk, will receive bids until Oct. 29 for the construction of a complete sewerage system, including a 20x28-ft. Imhoff tank, etc. Olmsted & Gillelen, 1112 Hollingworth Bldg., Los Angeles, consulting engineers, A. J. Kerr, town engineer. Noted April 15.

California

AVON (Associated P. O.)—The Associated Oil Co., Sharon Bldg., San Francisco, will build a group of buildings for an oil refinery, to include tanks, stills, pipe lines, etc. Estimated cost, $2,000,000.

SAN DIEGO—The Bureau of Yards & Docks, Navy Department, Washington, D. C., is having plans prepared for the construction of a surgical laboratory in connection with the proposed hospital at Balboa Park. Estimated cost, $2,000,000. F. W. Southworth, engineer.

SAN FRANCISCO—The U. S. Rubber Co., 336 2nd St., received bids for the construction of an addition to its rubber plant, from William Martin, 180 Jessie St., $53,900, and D. B. Farquharson, 1760 Ellis St., $57,500.

Connecticut

EAST HARTFORD—The town will soon receive bids for the construction of a reservoir dam, chlorinating plants and pipe lines. Estimated cost, $300,000. C. H. Olmstead, town engineer.

District of Columbia

WASHINGTON—J. A. Cullen, Cavendish Apartments, wishes to lease a small chemical plant with the privilege of purchasing. He prefers one with a crusher and ball mill, to be located in the eastern section of the country and have good transportation facilities. He also wishes to buy sheet lead, rectangular crystallizing vats, and proof pumps, motors, pulleys, shafting, etc.

Florida

TALLAHASSEE—The city plans to construct gas and water plants, also install machinery in same. Estimated cost, $65,000.

Illinois

CHICAGO—The Dallas Brass & Copper Co., 225 North Jefferson St., has awarded the contract for the construction of a 5-story, 100x200-ft. factory, on Orleans St. and Institute Pl., to G. Thompson & Son, 30 North LaSalle St. Estimated cost, $300,000.

Kansas

ELK CITY—The city has awarded the contract for the construction of a water system and a filtration plant, to Johnson, Morris & Hill, Independence, at $21,300. Noted Sept. 25.

Maryland

BALTIMORE—J. H. Cottman & Co., 812 Keyser Bldg., has awarded the contract for the construction of a 1-story, 40x140-ft. chemical factory, on Columbia Ave. and Beaver St., to Richard Morton. 812 Equitable Bldg. Estimated cost, $15,000.

Massachusetts

WOBURN—The Louis Foucar Co., manufacturer of leather, plans to rebuild its factory which was recently destroyed by fire. Estimated cost, $60,000.

Minnesota

ST. PAUL—J. W. Stevens, architect, Exchange Bank Bldg., is receiving bids for the construction of a 4-story, 62x98-ft. paint factory on University Ave., for the Mutual Paint Co., Exchange Bank Bldg. Estimated cost, $80,000.

Missouri

NECK CITY—Smith & Co. is having the old mill on Reliance ground remodeled and is in the market for 1 set of rolls and 3 tables. J. E. Smith, manager.

ST. LOUIS—The Mineral Refining & Chemical Corporation, Iron Mountain tracks and River Des Peres, plans to construct a chemical plant, and is in the market for chemical manufacturing equipment. Estimated cost, $4,000,000.

ST. LOUIS—The St. Louis Brass Manufacturing Co., Washington and Jefferson Aves., has awarded the contract for the construction of a 5-story, 80x110-ft. factory, at 2600 Washington Ave., to the James Black Construction Co., Wright Bldg. Estimated cost, $500,000. Noted Sept. 14.

Nevada

LUNNING—The United Lodi Mines Co. plans to construct a hoist compressor, concentration and cyanide plant in connection with its silver and lead mine at Lodi. The company is in the market for concentrators and shiners. Estimated cost, $25,000. Homer Wilson, general manager.

New York

ALBANY—Witherbee, Sherman & Co., 2 Rector St., are having plans prepared for the construction of a 1-story fertilizer plant on Westerlo Isle. Estimated cost, $1,000,000.

DEXTER—The Dexter Sulphite Pulp & Paper Co. plans to construct a plant for the reclamation of commercial alcohol from waste black liquor in sulphite pulp process. Estimated cost, $300,000. Address, H. O. Long, Care of company.

GENEVA—The Geneva Limestone Co. plans to install two 42x48-ft. jaw crushers and transmission for same. C. Hutchins, manager.

MEDINA—The Niagara Sprayer Co. has purchased a site on Telegraph Rd., and plans to build a chemical manufacturing plant on same, for the manufacture of calcium arsenate.

STATEN ISLAND—The Construction Division of the War Department, Washington, D. C., will soon receive bids for the construction of a photographic laboratory, etc., in connection with the proposed Aerial Defense Station. Estimated cost, $1,000,000.

ROCHESTER—The H. E. Mole Manufacturing Co. plans to construct a tile and brick laboratory on Burrows St., and is in the market for laboratory equipment. Estimated cost, $12,000.

North Carolina

ENFIELD—The city plans to complete the waterworks and sewerage systems. Estimated cost, $75,000. J. B. McCrary Co., Third National Bank Bldg., Atlanta, Ga., engineer.

FRANKLINTON—The Mayor will soon award the contract for installing water and sewerage systems, to include a sewage disposal plant, etc. Estimated cost, $40,000.

Gilbert C. White, Durham, Engineer.

North Dakota

MINOT—The city voted $280,000 bonds for the installation of a sewage disposal plant. Project includes Imhoff tank, trickling filters, etc. E. J. Thomas, engineer. Noted Sept. 14.

Ohio

CLEVELAND—The Metals Plating Works, 7019 Quincy Ave., has awarded the contract for the construction of a 1-story, 34x90-ft. factory, at 9607 Quincy Ave., to W. F. Hyde Co., 1008 Scoville Ave. Estimated cost, $10,000.

CLEVELAND—The Ultimate Tire & Rubber Co., Hippodrome Bldg., is having plans prepared for the construction of a 2-story, 100x250-ft. rubber factory, on East 152nd St. Estimated cost, $200,000. W. S. Ferguson, 1900 Euclid Ave., engineer.

NORWOOD—The city plans to install a water softening system in connection with the proposed waterworks. Estimated cost, $50,000. Allen Kisinger, city engineer.

Oklahoma

ADA—The city is having plans prepared for the construction of a sewage disposal plant. Johnson & Benham, Fireston Bldg., Kansas City, Mo., consulting engineers.

GARBER—The city has awarded the contract for the construction of a sewerage system to include a disposal plant, to L. A. Galleciez, 1509 West Cherokee Ave., Enid. Estimated cost, $51,048.

HARTSHORNE—The city will soon award the contract for the construction of a gravity type rapid sand mechanical filter plant, clear well coagulating basin, pipe gallery, etc. Estimated cost, $25,000. V. V. Long & Co., 605 Capital Hill, engineers. Noted Aug. 15.

HENRYETTA—Albert Rowing plans to construct a 2-story, 70x160-ft. glass factory on Main St. Estimated cost, $75,000.

MIAMI—The Miller-Worley Tailing Mill Co., Tar River, is having the old Schultz mill moved from Lincolnville to Tar River to operate the Croesus tailings and is in the market for a gas engine and 3 tables. W. C. Miller, superintendent.

PICHER—The Cortez Mining Co. is having the old True Blue mill moved from Quapaw and will erect it on Commonwealth lease, here. The company is in the market for a compressor, 2 sets of rolls, hoist and 2 tables. M. Lichliter, superintendent.

PICHER—The St. Regis Mining & Smelting Co. is having its old mill moved from Joplin to a new lease here, and is in the market for jig irons, 3 tables, etc. T. Shelton, superintendent.

TAR RIVER—The Oklahoma Woodchuck Zinc & Lead Co. is building a flotation plant at its zinc and lead mine here, and is in the market for 1 rougher and 1 cleaner flotation machine. Oscar Bailey, superintendent.

Pennsylvania

PORT KENNEDY—The Valley Forge Magnesia Co. plans to construct a 1-story, 35x177 and 32x177-ft. factory. Work will be done by day labor.

Rhode Island

CENTERVILLE—The Warwick Mills have awarded the contract for the construction of sand filter beds, etc., to J. McCusker, Phenix. Estimated cost, $35,000.

Texas

GORMAN—The city has awarded the contract for the installation of a sanitary sewer and disposal plant, to the Winslett-Eldredge Co., 1001 Main St., Dallas, at about $159,000.

West Virginia

MARTINSBURG—The city has awarded the contract for the construction of a sewage disposal plant, to the Cox Construction & Lumber Co., Martinsburg, at $48,561. Noted May 15.

Wisconsin

MILWAUKEE—J. W. Ellms, engineer, 1263 Cooke Ave., Cleveland, Ohio, will complete experiments about Feb. 1, for construction of a filtration plant and will submit same to City Council for its action. Estimated cost between $4,000,000 and $5,000,000.

RACINE—Alvord & Burdick, engineers, 8 South Dearborn St., Chicago, are preparing plans for the construction of a filtration plant, the enlargement of the storage plant and extension of distribution facilities, in connection with the municipal waterworks here.

Ontario

NIAGARA FALLS—C. M. Borter, architect, 102 Main St., will soon award the contract for the construction of a 2-story Collegiate Institute, for the High School Board. Chemical and physical laboratory equipment will be installed in same. Estimated cost, $100,000.

FORD CITY—The Separate School Board has awarded the contract for the construction of a 2-story school, to Wells & Gray, Confederation Life Bldg., Toronto. A physical and chemical laboratory will be installed in same. Estimated cost, $140,000.

COMING MEETINGS AND EVENTS

THE AMERICAN GAS ASSOCIATION will hold its annual convention and exhibition of gas appliances and apparatus at the Hotel Pennsylvania, New York, Oct. 13 to 18.

THE AMERICAN IRON AND STEEL INSTITUTE will hold its sixteenth general meeting at the Hotel Commodore, New York, Oct 24 and 25.

THE SOCIETY OF INDUSTRIAL ENGINEERS will hold its fall convention Oct. 29 to 31 inclusive, at Cleveland, Ohio.

INTERNATIONAL TRADE CONFERENCE has been called by the Chamber of Commerce of the United States the week of Oct. 20, at Atlantic City. The International Trade Conference tour starts Oct. 17 and will continue until Nov. 28, 1919.

Industrial Notes

THE CALKINS CO., Los Angeles, announces the removal of the company's sales rooms and offices to larger quarters at 934 South Main St., Los Angeles. Mr. H. J. Parsons, the manager, reports an exceptional demand for laboratory equipment and chemicals.

THE RICHARDSON-PHENIX CO. announces the appointment of Mr. L. E. Strothman as vice-president and general manager, and Mr. J. William Peterson as president and treasurer.

THE HOLMES ADVERTISING SERVICE, Pittsburgh, Pa., reports that Mr. William H. Harris, district representative of the Colonial Supply Co., has removed his offices from the Federal Bldg. to 507 Stambaugh Bldg., Youngstown, Ohio.

HAMILTON & HANSELL, INC., New York, announces that the name of the firm has been changed to the American Transmarine Company, Inc.

THE CANADIAN WESTINGHOUSE CO., LTD., Hamilton, Ont., announces that Mr. N. S. Braden, formerly sales manager, has been elected vice-president, and Mr. H. M. Bostwick, formerly assistant sales manager, has been appointed sales manager.

THE WESTERN RESEARCH CORP., Denver, Colo., has issued a booklet covering data on the corporation, the organization, financial, laboratory departments, samples for testing laboratory tests, mechanical and chemical tests, charges, oil flotation tests, investigation of oil shales, density and hardness of materials, equivalents of the Baumé scale and specific gravity of oils, mineral deposits, non-metallic minerals and miscellaneous non-metallic minerals.

THE WESTINGHOUSE ELECTRIC & MFG. CO. announces that Mr. Arthur B. Reynders, formerly director of production at East Pittsburgh, has recently been made works manager of the East Springfield plant.

The objects of the PAN-AMERICAN SOCIETY OF THE UNITED STATES as set forth in its charter are:

1. To promote acquaintance among representative men of the United States and those of the other republics of America.

2. To show hospitality and attention to representative men of the other republics of America who visit the United States.

3. To take such other steps, involving no political policy, as the society may deem wise to develop and conserve mutual knowledge and understanding and true friendship among the American republics and peoples.

As a step toward the realization of these aims the society has undertaken a publication, which is designed both to keep the members in touch with what the society is doing and to acquaint them with what is going on in our sister republics. The *Review* will endeavor to combine personal information with information on governmental, legal and commercial subjects and the editor will be glad to receive any matter coming within those categories. The *Pan-American Review* is, in other words, a "step," not involving any "political policy," but intended "to develop and conserve mutual knowledge and understading and true friendship among the American republics and peoples." The Pan-American Society can be addressed at 15 Broad St., New York City.

MR. CHARLES P. MADSEN has removed his laboratory from 44 Walnut St., Newark, N. J., to 33 East 17th Street, New York City, where he has more extensive facilities for investigation and demonstration of electrolytic and other processes.

THE GOULDS MFG. CO. of Seneca Falls, N. Y., has opened a district sales office in Detroit, Mich., in the Dime Bank Bldg., which is in charge of Mr. E. B. Gould.

THE NORTON CO. and the NORTON GRINDING CO. are now being conducted by the Norton Company with the following board of directors: George I. Alden, chairman of the board; Mr. Charles L. Allen, president and general manager; Mr. Aldus C. Higgins, treasurer and general counsel; Mr. George N. Jeppson, secretary and works manager; R. Sanford Riley and John Jeppson

TAGGART & YERXA, a new partnership, has opened a testing and analytical laboratory at 165 Division St., New Haven, Conn. It is prepared to act as consultant on the operation or design of plants for the treatment of ores and metal plant wastes and for crushing and handling rock.

THE SMITH CHEMICAL & COLOR CO., INC., importer, exporter and manufacturer of chemicals and colors, with main offices located at 116 Nassau St., New York City, has been formed. Mr. Casper Smith, organizer of this company and its president, will be the active operating head of this new organization. He was the director of sales for the Katzenbach & Bullock Co. until recently, when he resigned to organize the new company.

THE HERCULES ENGINEERING CORP. announces the creation of a new department for the design and construction of the special equipment necessary for the generation and handling of all commercial gases. This department will be under the direction of Mr. Richard Neuhaus, for many years in technical charge of plant operation for the Electro-Bleaching Gas Co., Niagara Falls, N. Y.

THE CELITE PRODUCTS CO. has appointed Mr. Charles P. Derleth as its St. Louis representative. This company is to be represented in the Bronx, Brooklyn and Long Island districts of New York by Mr. Vincent A. Lambaise, who for several years past has been active in sale promotion of Sil-O-Cel and Filter-Cel.

THE JEFFREY MFG. CO., Columbus, Ohio, has opened a new branch office in the Book Bldg., Detroit, with Mr. O. B. Wescott in charge.

THE LAKEWOOD ENGINEERING CO., Cleveland, Ohio, calls attention to a bulletin, Vol. 1, No. 1, on its products which was dropped by Mr. Mitchell on Aug. 15 in his aëro flight with Lieut. Comey from Dayton to Cleveland.

L. V. ESTES, INC., announces that Mr. Charles W. McKay has taken charge of its appraisal division. This division specializes in the appraisement of industrial properties for Federal income tax purposes and in the appraisement of public utility properties in connection with rate cases.

THE AMERICAN STEAM CONVEYOR CORP. announces the promotion of Thomas O. Morgan, recently head of the service department of the New York office, to the position of sales engineer for Long Island and Connecticut territory. The office of Mr. H. S. Valentine, sales engineer in charge of the Philadelphia territory, has been established in the North American Bldg.

THE UNITED FILTERS CORP. announces a line of filter presses of the plate-and-frame and recesses types to be known as "United." This places the corporation in a position to furnish the three types of filters in general use—the pressure-leaf type, represented by the Kelly and Sweetland filters, the continuous suction type, represented by the American filter, and the plate type, known as the "United." It will also enable it to offer the most appropriate type of filter for different kinds of work. Bull. No. 50 illustrates the new presses.

THE FALCON STEEL CO. is erecting a new sheet mill at Niles, Ohio, with eight stands of electrically driven rolls, which is to be of the most modern type. Powdered coal will be applied to the sheet and pair furnaces as well as a slabbing furnace, two double box double chamber annealing furnaces, three galvanizing kettles and power plant boilers. A blue annealing furnace will be included in the furnace equipment. The initial installation of coal-preparing apparatus will consist of a complete 5-ton coal pulverizing plant, including the necessary coal crusher, elevators, crushed coal bin, Ruggles-Coles drier and Raymond mill, together with the powdered coal hoppers for storing powdered coal at the furnaces, powdered coal feeders, burners, etc. The pulverized coal will be transported from the milling plant through standard 4-in. wrought pipes to storage bins in the power house and throughout the mill by the Quigley Compressed Air System. Contract for the complete fuel equipment has been awarded the Quigley Furnace Specialties Co. of New York. It is anticipated that this mill will be in operation by Jan. 1.

DANTZIG, PFEIFFER & RITT announce the formation of this firm of consulting mathematicians, with offices at 500 West 116th St., New York City. This firm undertakes to handle all problems arising in industry for the solution of which the knowledge of a mathematical specialist may be necessary. Each of the members of the firm has been privately engaged for some time in work of this nature, in addition to his other professional activities, and it was at the suggestion of clients that the decision was made to set up a consulting service which would extend to the industrial world the resources of modern pure and applied mathematics. Dr. Dantzig is a graduate of the University of Paris and of the Ecole Supérieure d'Aéronautique et de Construction Mécanique. He has taught at Indiana University and at Columbia. During the war he was in charge of the mathematical work of the instrument section of the U. S. Ordnance. Dr. Pfeiffer received the degree of mechanical engineer from the Stevens Institute of Technology and the degree of Doctor of Philosophy from Columbia University. He has taught mathematics at Harvard, Princeton, and Columbia. He is an associate editor of the Annals of Mathematics. Dr. Ritt took the degree of Ph.D. at Columbia University. He was for three years at the Naval Observatory and has since taught mathematics at Columbia. During the war he was one of the chief ballisticians in the U. S. Ordnance.

Manufacturers' Catalogs

A. P. MUNNING & CO., Chicago, Ill., has issued Bull. 1000 on buffing and polishing compositions.

THE ALLIS-CHALMERS MANUFACTURING CO., Milwaukee, Wis., calls attention to Bull. No. 1096-A, dated March, 1919, on Direct Current Motors and Generators, Types "K" and "KC"; Bull. No. 1538, dated June, 1919, entitled "Forgings."

New Publications

NEW UNITED STATES TARIFF COMMISSION PUBLICATIONS: Information Concerning Zinc Ore; Information Concerning the Pyrites and Sulphur Industry; Information Concerning the Potash Industry; Information Concerning Optical Glass and Chemical Glassware; Information Concerning Manganese Ore; Census of Dyes and Coal-Tar Chemicals, 1918; Information Concerning Tungsten-Bearing Ores; Information Concerning the Magnesite Industry. With the exception of the Census, the publications were printed for use of the Committee on Ways and Means, House of Representatives.

UNITED STATES COUNCIL OF NATIONAL DEFENSE: A Tribute and a Look Into the Future, by Grosvenor B. Clarkson, Director of the Council; An Analysis of the High Cost of Living Problem, submitted by the Director of the Council to the Hon. N. D. Baker, Secretary of War; The United States Council of National Defense, by Emily Newell Blair.

NEW BUREAU OF STANDARDS PUBLICATIONS: Scientific Paper No. 337, Constitution and Metallography of Aluminum and Its Light Alloys With Copper and With Magnesium, by Paul D. Merica, R. G. Walterberg and J. R. Freeman; Tech. Paper No. 121, Strength and Other Properties of Wire Rope, by J. H. Griffith and J. G. Bragg; Tech. Paper No. 123, Physical and Chemical Tests on the Commercial Marbles of the United States, by D. W. Kessler; Tech. Paper No. 129, Notes on the Graphitization of White Cast Iron Upon Annealing, by Paul D. Merica and Louis J. Gurevich; Tech. Paper No. 116, Silica Refractories, Factors Affecting Their Quality and Methods of Testing the Raw Materials and Finished Ware, by Donald W. Ross; Tech. Paper No. 136, Determination of Free Carbon in Rubber Goods, by A. H. Smith and S. W. Epstein.

NEW BUREAU OF MINES PUBLICATIONS: Bull. 176, Recent Developments in the Absorption Process for Recovering Gasoline From Natural Gas, by W. P. Dykema; Bull. 178-A, War Gas Investigations of the Bureau of Mines, by Van H. Manning; Tech. Paper 212, The Determination of Combustible Matter in Silicate and Carbonate Rocks, by A. C. Fieldner, W. A. Selvig and G. B. Taylor; Bull. 150, Electrodeposition of Gold and Silver From Cyanide Solutions, by S. B. Christy; Bull. 178-B, War Minerals Nitrogen Fixation and Sodium Cyanide, by Van H. Manning; Investigation Series No. 18, Zinc Industry in Belgium, by March F. Chase; Present Conditions in the Wisconsin Zinc District, by F. B. Hyder.

NEW U. S. GEOLOGICAL SURVEY PUBLICATIONS: Preliminary Report on the Mineral Resources of the United States in 1918, Introduction by Edson S. Bastin, statistics assembled by Martha B. Clark and data furnished by specialists of the Division of Mineral Resources, published Aug. 7, 1919; II:4, Prices of Coal and Coke 1913-1918, by C. E. Lesher (Mineral Resources of the U. S., 1918, Part II), published Aug. 29, 1919; II:31, Petroleum in 1917, by John D. Northrop (Mineral Resources of the U. S., 1917, Part II.), published Aug. 4, 1919; I:A Mineral Production of the United States in 1916, Introduction by H. D. McCaskey, Summary by Martha B. Clark (Mineral Resources of the U. S., 1916, Part I), published June 28, 1919.